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# A Multilevel Model of Poverty, Community Factors, and Learning for Students with Disabilities.

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Running head: Multilevel Model for Students with Disabilities

A Multilevel Model of Poverty, Community Factors, and Learning for Students with  
Disabilities.

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### Abstract

Students with disabilities face challenges to academic success that can be exacerbated by the effects of poverty. In this study, Hierarchical Linear Modeling (HLM) was used to analyze the effects of socio-economic status, social capital, and threats to safety on literacy test scores for students with disabilities. Results of the analysis indicate that discipline rate had a significant effect on mean district scores on statewide standardized tests, but not on the impact of socio-economic status on test scores. Conversely, the percent of college graduates in a school district did not have a significant effect on district scores, but moderated the relationship between socio-economic status and test scores. The gap between lower and higher socio-economic groupings of students grew higher as the percent of college graduates in a district increased. Results of this analysis have implications for educational policy for students with disabilities who live in poverty.

*Keywords: Bourdieu, bullying, hierarchical linear modeling, social capital,*

*Special Education*

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## Introduction

Students with disabilities and their families face obstacles posed by the disability to succeeding in life and integrating into the community. Difficulties overcoming these obstacles can be exacerbated by the effects of poverty and lack of resources. In addition to these socioeconomic challenges, threats to safety can inhibit learning (Maslow, 1943a). These threats to safety are particularly acute for students with disabilities, as they are disproportionately victims of bullying and suffer the consequences of that bullying more severely than their peers (Hartley, Bauman, Nixon & Davis, 2012; Russel, Sinclair, Poteat & Koenig, 2012).

One avenue of resources that may help students with disabilities overcome these challenges is social capital or access to knowledgeable others, who can provide guidelines and information about how to navigate challenges. (Bourdieu, 2011). Education also holds the promise to help students with disabilities overcome challenges caused by disability, but access to that education has proceeded erratically in the United States. As late as 1969, the state of North Carolina made it illegal for parents of children with disabilities to persist in forcing the attendance of their children after they were excluded from public schools (Yell, Rogers & Rogers, 1998).

Educational policy has evolved since then such that currently the education of students with disabilities is both mandated and monitored for progress (Edwards, 2007). This monitoring takes the form of reviewing the results of standardized assessments for students with disabilities who take the regular state assessments or alternative assessments designed for students with the most severe cognitive disabilities. Although the federal government has allowed the use of an assessment for students who do not

have the most severe cognitive disabilities, but may have difficulty with the regular assessment, only nine states have used such an assessment (Chudowsky & Chudowsky, 2009). Despite the allowance for the alternative assessments, students with disabilities fall behind their peers on state assessments (Missouri Department of Elementary and Secondary Education, 2016). For state and federal government, student learning, as evidenced by performance on standardized tests, is a key indicator for determining how well schools are meeting the needs of students with disabilities.

### **Socioeconomic factors**

Educators cannot eliminate poverty, although they must deal with its repercussions by finding ways to moderate those effects on student learning. Abraham Maslow (1943a) theorizes that there are needs that must be met before people can be motivated to meet other needs and that physical needs and safety are the most basic of those needs. Basic physical needs can interfere with attention and prioritization of learning for those who are in need. David Berliner (2009) points out that there are physical factors related to poverty which impact education. Some of these factors, such as environmental toxins, low birth weight, and fetal poisoning directly affect the nervous system and can lead to a variety of cognitive and behavioral difficulties. Compounding these health issues is a relative lack of health care for the poor that can continue to affect learning throughout the child's education (Berliner, 2009; Krashen, 2011)

One of the basic physical needs that Maslow (1943a) specifically mentioned was the need for food. Like air for a drowning man, food to the hungry occupies the full attention, leaving little for the demands of academic learning. Berliner (2009) cites statistics that of the families deemed to have very poor food security, 20% report that one

or more of their members has been without food for at least three days per month.

Maslow (1943a) states that people who have undergone deprivation experience the threat of deprivation more intensely than those who have never been deprived, so children who have gone a day without food may be preoccupied with the threat of hunger during school even when they are not currently hungry.

### **Threats to safety**

Maslow identified the need for safety as another of the basic needs (1943a). For students with disabilities, this need for safety is often threatened because of the stigma associated with disability and the bullying that can accompany that stigma. Trainor (2010b) identifies stigma as one of the three factors that affect students with disabilities, and impede their ability to form social capital. Stigma puts students with disabilities in a less powerful social position, which makes them more at risk of bullying. Carney, Jacob, and Hazler (2011) define bullying as a form of violence repeated over time by someone more powerful, whether that power is physical or social. Holzebauer and Berven (1996) refer to bullying or harassment which occurs because of a disability as *disability harassment*. Hartley, Bauman, Nixon, and Davis (2015) found evidence that students with disabilities reported twice as much daily physical harm and daily emotional harm as their peers. The high rate of bullying takes a toll on students with disabilities in terms of social and health outcomes according to Russel, Sinclair, Poteat, and Koenig (2012). They calculated odds ratios for students reporting different types of bullying in relation to 13 negative social and health outcomes which included substance abuse, truancy, absence, whether a student had been threatened with a weapon and other indicators. For each of these negative outcomes, students who reported bullying because of disability

had the highest odds ratio, in other words, they were more likely to suffer the negative outcomes than victims of any other type of bullying. The effect of the bullying seems to have been more intense for students with disabilities than for any other group.

### **Social Capital**

One of the avenues through which people can acquire assets to help overcome challenges is through social capital. Pierre Bourdieu (1992, 2011), Robert Putnam (2001), and others have defined the concept of social capital in slightly different ways, but generally they use it to refer to benefits that a person receives as a result of networks of relationships (Bexley, 2007; Bourdieu, 2011; Portes, 2000; Putnam, 2001). I will use Bourdieu's definitions and theory to inform this study.

Bourdieu defines social capital as one of three forms of capital, along with economic capital and cultural capital that are mutually exchangeable in some circumstances. Economic capital is financial capital in a traditionally economic sense. Cultural capital, which he also refers to as information capital, consists of knowledge, culture, and education. Social capital refers to the benefits to which one has access as a result of belonging to social networks and groups. This study will rely on the mechanism by which cultural capital can be acquired by students with disabilities and their families through social capital. Trainor (2010b) relates an example of this mechanism by the transfer of knowledge about available services from members of a parent group to a mother with less technical knowledge of rights under the Individuals with Disabilities Act (IDEA). Through membership in the group, cultural capital in the form of knowledge of services available was exchanged for social capital which the parent acquired by membership in the parent group.

Bourdieu (2011) first conceived of cultural capital as a way of explaining why children of some families did better than others. In particular, families with more economic capital consistently outperformed families with less. He theorizes that families with more cultural capital begin to inculcate their children with the attitudes and skills necessary to thrive in an academic setting long before the children begin school. Carter, Austin, and Trainor (2011) found that cultural capital in the form of parental expectations for students and such practices as assigning chores had a significant effect on success in making the transition from school to work for students with disabilities.

It is important to understand that for Bourdieu, economic, social, and cultural capital, are all forms of the same capital through various forms of exchange. The means by which students with disabilities and their families can improve learning outcomes is specifically cultural capital. Knowledge about education and habits related to learning are forms of cultural capital (Bourdieu, 2011). However, the means by which these habits and skills are acquired is through social capital, that is, they are benefits acquired through membership in groups and networks of acquaintances. Social capital is the means by which resources are acquired and resources themselves are cultural capital. Since I am concerned about the acquisition of helpful resources by students with disabilities, I am interested in social capital, although the resources that will help them learn are technically cultural capital

### **Problem Statement**

The theoretical insights of Bourdieu and Maslow have been demonstrated in the general public, but research into the applicability of these insights into the lives of students with disabilities has been limited (Bourdieu 2012; Jorgensen, Gates & Roper,

2014; Krashen, 2010). Research into the effects of Bourdieu's concept of social capital on students with disabilities has focused on acquisition of operational benefits such as knowledge of available services or transition to employment, but there is a gap in the literature on the effects of social capital on academic learning (Trainor, 2010a; Trainor, 2010b; Whitney, Langley-Turnbaugh, Lovewell & Kim, 2012; Wilkens & Hehir, 2008). In the same way, research into the effects of Maslow's conception of threats to safety on students with disabilities has focused on bullying and the negative outcomes of threat, but not on student learning (Carney, Jacob & Hazler, 2011; Gorman-Smith, 2012). Perhaps more importantly, there has been a lack of research into how the environmental factors of social capital and threat to safety can moderate the effect of socioeconomic status on learning for students with disabilities.

### **Purpose of the Study**

The purpose of this study was to relate the insights of Bourdieu and Maslow to the academic learning of students with disabilities. In particular, I examined the effects of social capital, cultural capital, and threats to safety on learning for students with disabilities through hierarchical linear modeling (HLM). As part of the analysis available through HLM, I sought to determine if social capital and threat to safety moderate the effect of socioeconomic status on learning. The results of the current study can inform more effective policies to deliver the benefits of education to students with disabilities who experience poverty, perhaps the most vulnerable of all populations.

### **Operational Definitions**

Throughout this study some terms were used with specific and sometimes unusual meanings, so it was worthwhile to include a short list of some terms with the definitions that were assumed below.

**Cultural capital.** Cultural capital refers to the knowledge and attitudes that are acquired over a period of time. Bourdieu uses the term cultural capital to refer to the knowledge and taste in relation to the arts, to knowledge of scientific fields, and to education. Cultural capital can be embodied, as in a scientist embodying a particular field of science, objectified, as in a work of art, or institutionalized, as in a university degree. I focused on the institutionalized form of cultural capital, in that I basically counted college degrees in a community with the intention of representing the embodied form of cultural capital, whereby people who have graduated from college have become immersed and have mastered the attitudes and knowledge of higher education. The cultural capital possessed by these graduates will be viewed as the educational resources that can be acquired through social capital.

**Social capital.** Social capital refers to the benefits one receives through membership in groups and networks of acquaintances. I cannot directly measure the networks, or acquisition of cultural capital, but I can measure the availability of cultural capital related to education within the community by determining the percent of people in the community with a college degree. The process of acquiring the cultural capital of these college graduates is analogous to osmosis and the movement of molecules through cell membranes. Through membership in churches, conversations on playgrounds, parent teacher organizations, and many other avenues, knowledge related to success in school spreads through a community. I assumed for this study that the sharing of resources with

students having disabilities was relatively constant across school districts. Therefore, the number of college graduates was used as a measure of the benefits of social capital for students with disabilities.

**Socioeconomic status.** Socioeconomic status refers to the level of family income and other resources. It was measured at the individual level by whether or not the student received free or reduced lunch.

**Academic achievement.** Academic achievement was measured by scores on objective assessments. Academic achievement was operationalized as Missouri Assessment Program (MAP) scores which refer to score received in the annual standardized test of English Language Arts. For this study, the scale score of each student was centered on the proficiency cut score for the student's grade by subtracting the cut score from the student's scale score. This calculation resulted in the distance the student's score is from proficiency.

**Threats to safety.** Students with disabilities experience threats to safety in schools often because of bullying. They are bullied at higher rates than their peers since they are more vulnerable and students who bully tend to select socially less powerful peers to bully (Hartley, Bauman, Nixon & Davis, 2015). Researchers have identified *disability harassment* as a specific type of bullying related to disability (Holzebauer & Bervin (1966). The effects of higher rates of bullying on students with disabilities are exacerbated by the intensity of the effect of bullying for students with disabilities. Students with disabilities are affected disproportionately by the negative effects of bullying (Russell, Sinclair, Poteat & Koenig, 2012). School data about students who bully support the idea that the prevalence of bullying is reflected in overall rates of office



referrals (ODRs) since bullying is associated with higher rates of ODRs (Predy, McIntosh & Frank, 2014). Also, research examining youth with extreme anti-social behavior shows that a significant characteristic of those youth is that they have exhibited bullying behavior in the past (Wallinius, Billstedt, Anckarsater, & Hofvander, 2016). It is, therefore, logical to assume that rates of ODRs reflect perceived threats to the safety of students with disabilities. Threats to safety were indicated by ODR rate which simply means the number of office referrals that are submitted by school districts to the state for discipline per hundred students. This information is available on the public website of the Missouri Department of Elementary and Secondary Education (DESE).

**Social capital and threats to safety as moderators.** I have explained why socioeconomic status, social capital, and threats to safety can affect academic achievement, but there is another level of inquiry that recommends itself. Although we might assume that these affects are additive, each having a particular weight to contribute to explaining academic achievement, it may be that the factors in combination may have greater or lesser strength than we examined in isolation. In other words, for students with disabilities, it may be that the lack of social capital compounds the effect of low socioeconomic status. In the same way, threats to safety may make it exponentially harder for a student with a disability to overcome the effects of poverty in order to achieve academic success. Consequently, I examined whether social capital and threats to safety moderated the relationship between socioeconomic status and academic achievement. Results of moderation for each of the community variables can inform policy for helping students with disabilities whose families are in poverty.

## **Hypotheses**

Several hypotheses were tested to address the problem:

1. Students receiving free or reduced lunch will have lower achievement scores.
2. Higher community social capital will be related to higher achievement scores.
3. Community social capital will moderate the relationship of socio-economic status to achievement scores.
4. Office discipline referral rate will be negatively related to achievement scores.
5. Office discipline referral rate will moderate the relationship of socio-economic status to achievement scores.

## **Assumptions and limitations**

One of the key assumptions of this study was that social capital of students with disabilities and their families can lead to the acquisition of cultural capital in the form of resources which can help students learn. Since the cultural capital of the community can be measured in one form by the percent of college graduates, I expected to see higher learning outcomes for students in communities with higher percentages of college graduates. Although students with disabilities have more challenges than their peers for acquiring social capital (Carney et al., 2011; Carter et al., 2006; Langley-Turnbough & Moeller, 2011; Trainor, 2010b), I assumed that there were in every community some channels of social capital by which cultural capital could be transferred. This study in effect tested whether those networks are functional – able to transmit cultural capital in the community. The beneficial effects of social and cultural capital on the learning of students with disabilities were dependent on those two factors: (a) the effectiveness of social groupings to allow formation of social capital and (b) the existence of cultural

capital that could benefit learning. Either one by itself would be insufficient (Bourdieu, 2011)

Another assumption was that the measures selected for the analysis adequately and reliably operationalize the constructs used in building the model. The percent of college graduates in a school district was used as an indicator of social capital since it was an indicator of the number of people with specific knowledge about educational systems and learning in the community. Office discipline referrals were used to indicate threats to safety since they reflect a degree of violence and instability in the school system. Eligibility for the free lunch program was used as an indicator of family socio-economic status and finally, the scale score for the (MAP) assessment of language arts was used as an indicator of learning. More detailed rationales for these indicators are included in the literature review.

### **Threats to validity**

Since this study took place within one county, the specific cultural realities of that county may have affected the results for impact of social factors on learning of students with disabilities, limiting the extent to which it can be generalized to other populations. However, the county has both urban and suburban districts, districts in relatively affluent areas, as well as relatively under resourced areas. This mix of districts makes it possible to apply lessons from this county to other counties with a mix of school districts. Even in counties with different cultures, the interplay of social capital, threats to safety, and the effect of socio-economic factors on learning will be present. Application of this model to datasets for other counties would help overcome this threat to external validity.

Another threat to validity is that both percent of college graduates and higher student scores may both be correlated with median income. However, according to Bourdieu's theory of social capital, this relationship would be expected, since the forms of capital are exchangeable. It is assumed that school districts have differing total wealth. The question is, how do social factors affect the learning of students with disabilities and, perhaps more importantly, how do these factors help narrow the gap between students with adequate financial resources and those without. If this study could illuminate some of the ways that economic factors affect learning, then it could be a valuable contribution to the literature.

### **Summation**

Given these limitations and delimitations, this study can still help fill gaps in the literature identified earlier. The emergence of standardized assessments taken by a large number of students with disabilities affords the opportunity to look systematically for patterns in their learning. Similarly, the availability of census data aggregated at the school district level allows the analysis of effects of community factors, such as percent of college graduates. Finally, there had not been hierarchical linear model of the effects of social capital and threat to safety as moderators for the impact of socio-economic status on learning for students with disabilities. The results of this study could help to deconstruct the effects of poverty into components that reflect the underlying social realities that affect families of students with disabilities, and the students themselves.

## **Review of the Literature**

### **Introduction**

Students who are determined to be eligible for Special Education services have a disability that affects their educational performance (Individuals with Disabilities Education Act, 2004). Since the disability affects their educational performance they have challenges not faced by their peers to overcome to meet desired learning outcomes and transition into a productive healthy life. Maslow (1943a) said that need for food, shelter, and safety can interfere with student learning for all children, so children who are poor and have a disability are doubly challenged. Social capital is one of the ways that people can acquire resources that may help them to prosper in their lives (Bourdieu, 2011; Portes, 1998). Social capital can provide access to knowledge and modes of behavior through networks of acquaintances and membership in groups that can in turn lead to successful outcomes. While students with disabilities may benefit from access to social capital, they may also have the most difficulty gaining access to resources through social capital.

Forming essential relationships may be made more difficult by having a disability because of the stigma associated with the disability (Wilkins & Hehir, 2008; Trainor, 2010a). Sometimes the students are placed in segregated environments as the most appropriate educational environment, which may remove students with disabilities from the pool of contacts and possible relationships that could benefit them (Trainor, 2010a). The authors sought to determine to what extent factors related to physical need, safety, and social capital affected the educational outcomes for students with disabilities. They also sought to determine to what extent students with disabilities are more or less

susceptible to the effects of these factors, and whether there are patterns to the effects of these factors within the population of students in Special Education. Student outcomes were examined in terms of achievement in school, as measured by mandated state assessments

The Trainor (2010a) study has implications for Special Education policy. Special education in the United States is governed by state and federal law. Since the No Child Left Behind Act (NCLB) school performance as measured by scores on standardized assessments has driven school reform across the United States. This school reform identifies failing districts and failing schools based on those assessments, with consequences of firing teachers and administrators, bringing in new administration and other such remedies Performance measures for students with disabilities are specifically tracked as part of this reform effort, again with the assumption that school districts will meet or fail federal and state standards based on the skill and effort that they bring to the process. However, if it can be demonstrated that student outcomes are affected by other factors in addition to the educational system, such as student and community factors, then more effective policies may be designed to shape the educational system to help students with disabilities. This study can be part of a more nuanced analysis of factors that lead to more effective school reform in the area of special education. The following sections will identify key student and community factors that may affect the impact of social capital on educational outcomes for students with disabilities. Research related to each construct, such as social capital, will be reviewed followed by a rationale for using a particular indicator to operationalize that construct.

## **Social Capital**

The concept of social capital has become popular as a construct that can help explain the way that people benefit from their social networks. Writers such as Pierre Bourdieu (2011), Robert Putnam (2001), and James Coleman (1999) have proposed theories of social capital that are related, but vary in definitions and terminologies.

Bourdieu's definitions and theory guided this study.

**Bourdieu's concept of social capital.** For Bourdieu, social capital is not an independent entity; rather it is one of three forms of capital which also include economic capital and cultural capital. These three are different forms of one another and can be exchanged for one another. He faults economists with reducing the scope of human activity to simply competition for economic capital. A more complete science of the human activity, an economy of practices as he terms it, would include social and cultural capital, by which the competition for capital continues by other means.

Bourdieu's concept of cultural capital emerged from his observation of differences in academic outcomes for students which seemed to follow economic capital. As he says,

The notion of cultural capital initially presented itself to me, in the course of research, as a theoretical hypothesis which made it possible to explain the unequal scholastic achievement of children originating from the different social classes . . . This starting point implies a break with the presuppositions inherent . . . in the commonsense view, which sees academic success or failure as an effect of natural aptitudes... (Bourdieu, 2011, p.82).

Rather than seeing academic success in terms of natural aptitudes, Bourdieu says that the hidden transmutation of economic capital into cultural capital is made through the domestic transmission of cultural capital. In other words, cultural capital which a family has obtained over the years is transferred to the children. The educational system cooperates in the reproduction of the social structure, by blessing the “hereditary transmission of cultural capital.” In other words, knowingly or not, the educational system gives approval to those children of families who have taught them to read and learn their multiplication tables among other educational attitudes and skills.

The process of acquiring cultural capital, as in the other forms of capital, comes through the investment of time and labor. The most accurate measures of cultural capital are related to the amount of time it takes to acquire it. This time of acquisition could be in childhood, and does not need to be intentional, such as a child’s learning pronunciation of words, or learning vocabulary itself. This inculcation of cultural capital requires free time for the parents and for the children and accumulates over years. The length of time the child has to continue this accumulation depends on the family’s ability to provide time “free from economic necessity”, such as working to help support the family.

Cultural capital is expressed in three forms: embodied capital, as in the learning of the individual; objectified cultural capital, which would be objects such as computers, works of art, or books; and institutionalized cultural capital such as certifications and degrees. College degrees convey a guarantee of the acquisition of cultural capital, which can be converted to economic capital when used as a qualification for a job. The percent of people with college degrees in a community is therefore one measure of the cultural capital in a community.



Social capital is the third form that capital takes. Bourdieu (2011) defines social capital as

... the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition - or in other words, to membership in a group (p. 86).

In other words, social capital consists of resources available to the individual through the groups to which she belongs. These groups could include family, a church, a political party, a sorority, or a school. Membership in the group implies a type of mutual availability to giving and receiving services or other resources. The group establishes a relationship between members which allows or encourages the exchange of resources. For example, a church member in need might ask for help from another member who might give financial help, or a tip about a job opening. The receiver of the tip spends social capital to receive the resources, while the giver, contributes to the good of the group and builds social capital. Bourdieu says that the volume of social capital an individual has depends on the size of the network of group members, and the sum of the resources each of the members has. A network of many people who do not have any capital would mean no social capital exists since it requires both a network and resources. Therefore the amount of resources in a community is a gauge of social capital. Since the mechanism at work in the sharing of knowledge depends not only on the networks, but on the resources available, in this study, the resources available through social capital will be the knowledge and *habitus*, discussed below, of the people who have college degrees. Since I could not measure the networks of the families of students with disabilities, I

assumed that some varying amount of social networking was available and treated it as a black box through which the resources flow. One of my assumptions is that social networks exist for families of students with disabilities. Finally, the cultural capital that the family receives helps inculcate the student with skills and *habitus* that can improve learning. For example, a mother of a student with disabilities might find out about services available for her child and techniques for helping the child learn through a meeting with other parents of students with disabilities. The parent having received cultural capital is able to obtain increased services, and begins to transfer cultural capital to her child through the techniques she learned. Although college degrees themselves are a form of cultural capital, I referred in this study to the percent of people with college degrees in a community as social capital, since the effect depends on the transfer of knowledge through social capital.

***Bourdieu's concept of field.*** Bourdieu's framework for the development and exchange of capital relies on his concepts of *field* and *habitus*. He defines *field* formally as "a network, or a configuration, of objective relations between positions" (Bourdieu & Waquant, 1992, p. 97) In other words, field is the space in which individuals are located with objective relations between them. He offers the analogy of a game as a more intuitive way to grasp the concept of field. The field does not have arbitrary rules in a rulebook as much as it has regularities that are understood, but not explicitly written down. There are stakes in the game and the players compete for those stakes that depend on their shared belief that the game is worth playing. Different players have different *trumps* as if holding a hand of cards. Some cards are worth more than others, but each person sees what is in her hand and builds strategies to compete most effectively. The

different forms of capital have value that varies across different field so that in one field, economic capital may be more important than in other fields. Bourdieu offers the image of a player with piles of different colored tokens representing different forms of capital.

We can picture each player as having in front of her a pile of tokens of different colors, each color corresponding to a given species of capital she holds, so that her *relative force in the game*, her *position* in the space of play and also her *strategic orientation toward the game*,... [emphases in original] the moves that she makes, more or less risky or cautious, subversive or conservative, depend both on the total number of tokens and on the composition of the piles of tokens she retains, that is, on the volume and structure of her capital. (p. 99)

Consider a child with a disability in a school with non-disabled peers and faculty who value academic success highly. What kinds of tokens does the child have, and how many of each? How might the child perceive his hand? Education can be viewed as a field in Bourdieu's sense of the term, in which children are forced to play, although the individual student's conceptions of the field may be very different from what educators think. Students may have very different goals than their teachers based on their *habitus*, explained below.

***Bourdieu's concept of habitus.*** Bourdieu defines *habitus* as

...the strategy generating principle enabling agents to cope with unforeseen and ever-changing situations... a system of lasting and transposable dispositions which, integrating past experiences, functions at

every moment as a matrix of perceptions, appreciations, and actions and makes possible the achievement of infinitely diversified tasks. (p. 18)

The agents referred to here are individuals engaging in the ever-changing situations of their lives. Based on their past experience they perceive life, locate themselves within it, and strategize about taking actions. Field and habitus are intimately related in the sense that “the field structures the habitus” through a conditioning process. The individual is shaped by the forces of the world in which she finds herself. Conversely, the field is a “cognitive construction” of the individual. The field has meaning and importance only through the minds of the participants. Bourdieu resists the temptation to build a model of social reality that is simply about the structure, as with economic models, or focus solely on the qualities of the subjective agent. With the interaction between field and habitus, he maintains the ability to look at relations of capital systematically, while providing a dynamic interpretation of the individual making strategies to thrive within those structures.

When *habitus* encounters the *home* field of which it is the product it is like a *fish in water* not feeling the weight of the water or questioning the rules of the field. It takes the world of the field for granted. This acceptance of the given world determines the selection of interests and of games that we want to play. Waquant (1992) gives the example that middle class academics, who having never been to a boxing match or spent time in a local gym cannot imagine what draws poor youths to invest themselves in such a self destructive pursuit as boxing. Similarly, poor youths would be baffled by endless hours spent debating social theory. If the *habitus* does not sensitize and mobilize individuals toward new pursuits, they will not play that game.

**Social capital as defined by other theorists.** The term social capital has been used by other theorists in slightly different ways than Bourdieu used it. Portes (2000) noted that there are two uses for the concept of social capital as it has been appropriated from sociology. In its original use, in the writings of Bourdieu (1992), its meaning referred to a quality or attribute of the individual. Portes notes that as the concept of social capital has been appropriated by other disciplines it often refers to communities or groups of people. For example, it might be argued that a community having a low level of social capital would therefore be poorly governed with ineffective policies, in comparison to a community with high levels of social capital, where good governance would prevail. He argues that this use of the term, as a quality of groups, often leads to circular logic, which can cloud thoughtful interpretation. Bexley (2007) specifically mentions that Robert Putnam (2001) uses this concept of social capital as a characteristic attached to communities. She notes the same tendency of the use of the communal definition of social capital to produce tautologies, such as “groups of winners tend to win” (p 19). In this document, Bourdieu’s use of the term, relating to the individual, was used conceptually.

**Social capital in special education research.** Drawing on the definitions and theories of social capital, researchers in special education have applied the theoretical framework of social capital to analyze and interpret the effects of social capital on students with disabilities. Students with disabilities face difficulties in benefiting from social capital because of difficulties with communication, stigma, and separation from peers (Trainor, 2010b).

***Triad of factors: communication, stigma, isolation.*** Trainor (2010b) observes that cultural capital can be material things, knowledge or dispositions that inform the actions and interactions of individuals. Trainor gives an example of a parent who joins a parent group and reads a parent's rights handbook, thus gaining cultural capital from social capital, in other words, gaining knowledge from social connections. During an IEP meeting, the parent may communicate an understanding of the system and of her child's rights within the system to garner desired services. If those additional services result in a child learning a skill that would lead to employment, then the social and cultural capital that the parent had earned could be translated into economic capital. In her qualitative study of parents' roles in the IEP process Trainor (2010b) found that parents with relatively lower socioeconomic status (SES) had *intuitive* cultural capital, that is, their knowledge of their children through day to day interactions. Higher SES parents had access to not only this intuitive cultural capital, but also more technical knowledge of the Individuals with Disabilities Education Act (IDEA) and its implementation. This additional cultural capital enabled the higher SES families often to advocate more successfully for their children. However, parent support groups can also provide social capital in which this higher level of technical knowledge can be shared; that is, the social capital of belonging to the parent support group could result in cultural capital that could be used to improve the life of the child. Trainor relayed the following quote from a parent learning from other parents.

I want to know what another child that's kind of like mine, what kind of services did they get because there's nothing really explaining what services are. And I've learned from other parents. I heard from other parents because my son had the

anxiety and kind of mental health. They started talking about what they [received], their experience. Their kid is out of college now, so I said, “Really? You can do that? Really?” (p. 42)

It is clear from the exchange that the parent received knowledge that she believed would change significant outcomes for her child. Her membership in this group was paying off in terms that speak not only of economic capital, but of life fulfillment for her child.

While the example above demonstrates social capital of the parent, researchers have found that factors associated with disability affect the social capital of students with disabilities. Trainor, Morningstar, Murray, and Kim (2013) found that students receiving special education are more significantly affected by lack of social capital than the general population. The authors focused their research on the importance of social capital for students with disabilities in the transition from school to postsecondary outcomes for high incidence disabilities. Analyzing data from the National Longitudinal Transition Study -2 (NTLS2) they selected students with high incidence disabilities including attention deficit disorder, learning disabilities, and emotional/behavioral disabilities for their study. Across all of the subjects in the study they found some positive outcomes, such as 64% registered to vote, and some negative, such as 35% of males and 18% of females having been arrested. The authors did not pursue a causal or correlational analysis to determine if measured indicators of social capital were correlated with positive or negative outcomes, but rather performed descriptive analysis of the data, giving percentages of the subjects who participated in various types of interaction. A key observation that they made was that the students with high incidence disabilities had barriers to social capital caused by

the disabling condition itself. These barriers fell into three categories. The first category was the effect of the disability itself to frustrate attempts to communicate or form relationships that might benefit the students. Second, and possibly related to the first, students with disabilities are often educated in separate environments, particularly when their behavior is deemed to be disruptive. Third, the stigma of having a disability may lead to prejudice that prevents the formation of beneficial relationships. Taken together, these three factors, (a) difficulty communicating and forming relationships, (b) separate environments, and (c) stigma, may define the mechanisms by which students with disabilities are cut off from the benefits of social capital in comparison with the general population. This triad of factors can be used as a guide for detecting threats to social capital in students with disabilities and will guide the discussion below.

*Social capital and low incidence disabilities.* While the Trainor et al. (2013) study examined the effects of social capital on students with high incidence disabilities, research suggests the effects are similar for students with low incidence disabilities. Carter, Austin, and Trainor (2011) examined factors affecting the transition of students with disabilities from school to paid employment for students with severe, low incidence disabilities. While it could reasonably be argued that all of the measures of learning in school are ways to monitor the progress a student is making toward post school outcomes, such as employment, this study tested for effects on employment rather than on school related assessments. The authors reasoned that if social capital is a meaningful factor for outcomes for students with disabilities, then it should be detected as having an impact on post school outcomes in addition to student learning assessments. The students selected for the study were those who had been deemed eligible for the alternate



assessment or were identified by their parents as possessing functional cognitive skill deficits. The resulting sample included 1510 students including 390 students with intellectual disability, 520 with autism and 600 with multiple disabilities. The dependent variable in the study was paid work in the community, that is, not school sponsored work. School sponsored work can be inflated by available budgets to provide work experiences in the school while paid work in the community would theoretically reflect the ability to perform work useful in the economy. In other words, school sponsored work might be an artificially supportive environment. The independent or predictor factors for the analysis were grouped as student demographic factors; student skill factors including ratings by parents and by teachers; family factors; school program, such as vocational or prevocational programs; and community characteristics, such as rural or urban, and whether the community had public transportation or transportation specifically for individuals with disabilities.

Carter and colleagues' study identified student skills that predict future employment as (a) the ability to communicate well with others, (b) independence in self care and (c) the ability to get to places outside the home independently (Carter et al., 2011). As with the students with high incidence disabilities, communication was a strong predictor of success. That finding supports a tenet of Trainor's (2010b) guiding triad of factors - that difficulty communicating and forming relationships is characteristic of the problems facing students with disabilities. Self care may also relate to difficulty forming relationships, since the lack of self care could result in rejection, making the development of some relationships more difficult. The ability to get to a job affects all employees, but for students with disabilities, the lack ability to get to places outside the home

corresponds to the effects of being educated in isolation. Isolation in the home severely limits access to social capital.

The same study found that family characteristics, or *habitus* as Bourdieu would say, were also correlated with positive outcomes, and conform to the expectation of the importance of social and cultural capital. Parents who had some college education, parents who assigned regular household chores, and parents who expected their children to eventually be self supporting inculcated attitudes about responsibility that were associated with higher percentages of post-school employment. Parents with college education have additional cultural capital to share with students, even severely disabled students, whether in improved ability to advocate for their child or other educational benefits. Similarly, parents who teach their children to do chores are imparting knowledge about the value and expectations of work, thereby shaping the *habitus* of their children. These results are in accordance with the Trainor et al. (2013) findings in which social capital was a predictor of student success.

***Communication and social capital of students with disabilities.*** Wilkins and Hehir (2008) suggest that the effects of a disability itself may restrict access to social capital for the student. In particular they examine difficulty in communication for students who are deaf. They specified that they are using a definition of social capital defined by Putnam (2001), whose conception was slightly different from Bourdieu's. They chose Putnam's particular definition of *bridging* social capital, which refers to benefits that accrue to the individual from networks that are outside of their close intimate relationships. According to Putnam, bridging social capital refers to networks that depend on informal communication with external networks. Specifically, they

referred to benefits from relationships between parents and teachers, or co-workers. In their examination of social capital for students who are deaf, they point out that without the ability to communicate, or communicate well with teachers and peers, social capital is cut off. This inability to communicate is made even more severe by the lack of ability to communicate well with parents. Since only three to four percent of deaf students grow up in families with a fluent signing parent, they do not share a common language with any of their family or community. The authors point out that there are two distinct sources of social capital for deaf students, that of the hearing community and that of the signing community. Social capital for these students is defined by the channel of communication. Although students who are deaf have a very specific limitation based on communication, their case confirms the more general pattern that affects students with other disabilities. If the disability impedes the ability to communicate, it can prevent the student from benefiting from social capital. This study confirms the importance of communication for social capital of students with disabilities.

Difficulty in communication is also extremely important to the social capital for students who are learning English (ELL). Trainor, Kim, and Murray (2014) identified students with disabilities who are learning English as another subset of students with disabilities who are affected by difficulties in communication. The population of ELL students with disabilities is growing, and concentrations vary across regions of the US, with the Southwest and eastern shoreline states having the most. Twenty-one percent of all US students speak languages other than English at home and 72% of the ELL students with disabilities in the Trainor et al. (2014) study were Hispanic. A majority, 65%, of ELL students with disabilities came from families whose annual income was \$25,000 or

less, a significantly higher proportion than students with disabilities as a whole at 35%. Hence, when considering the effects of social capital and other community factors on ELL students with disabilities there may be differences that are historically and culturally based in relation to community acceptance, issues of power and trust in light of current legal and political discussion, and the degree to which the families of the students are familiar with their rights under IDEA.

Cultural and linguistic diversity can affect the identification process for ELL students with disabilities. Over identification for these students seems to occur in high-incidence disability categories including learning disability, emotional and behavioral disability, and intellectual disability. Some reasons for this disproportionality may include a lack of unbiased reliable assessment instruments for this population and the similarity of presentation for disability and English language difficulties (Trainor, et al., 2014). One of the results of the analysis of the Second National Longitudinal Transition study (NLTS2) is that ELL students with disabilities were significantly less likely than English speaking students with disabilities to have been employed after high school although graduation rates are similar to students with disabilities as a whole. If social capital for students with disabilities is moderated by communication ability and inclusion in the community, then we can interpret some of these effects as the result of difficulty with communication. Clearly, legal issues around employment for this population may also have an effect.

Much of the social capital that we discuss in relation to students with disabilities is social capital that can be *exchanged* for cultural capital. Cobb (2013), in his analysis of literature related to the involvement of parents of ELL students with disabilities, used the

term socio-cultural capital to refer to the cultural element to the conception of social capital. He noted that Bourdieu used social capital and cultural capital as forms of capital that can be readily exchanged for one another. He also cited Portes (1998) as saying that for Bourdieu, “social capital is decomposable into two elements: first, the social relationship itself that allows individuals to claim access to resources possessed by their associates, and second, the amount and quality of those resources” (p. 3-4). The implication for our discussion of social capital and students with disabilities is that issues of stigma, exclusion, and communication may affect the social relationship. In addition, the amount and quality of the available benefits vary by community. A person with excellent social relationships to a network without access to employment will not have access to resources that lead to employment. The social relationship again, is necessary for attaining the resources, but not sufficient to gain adequate resources. In Cobb’s (2013) review of the literature around parents of ELL students with disabilities he focused much of his attention on Hispanic families since they were overwhelmingly the largest segment of ELL students with disabilities. He identified three areas of concern for Hispanic families with relation to the educational system: (a) power imbalance, (b) communication issues, (c) a sharp disconnect between the perspectives of the parents and the schools.

Cobb defined perceptions as “the way in which individuals view and define what surrounds them.” (p. 50) A difference in world view can lead to misunderstanding and a failure to agree on goals. He gives the example of mothers in one study, who did not agree that their children needed special education, and were not concerned about meeting benchmarks within a given time frame. Cultural differences may also exacerbate problems arising from a perceived imbalance of power in IEP meetings which may

alienate the parents. The author cited research indicating that in these circumstances, parents may not voice their concerns, and may become convinced that the educators did not expect or desire collaboration. The challenges facing parents of ELL students with disabilities and of schools educating them is to overcome cultural differences in order to establish social relationships which can allow the benefits of social capital to flow to the children.

**Education as social capital.** Educational efforts to improve the post secondary outcomes of students can be seen as a type of social capital. Through the relationship of student and teacher, the teacher shares knowledge and skills about how to attain desired goals. It is important, however, not to conflate the effects of education and of social capital, while remaining aware of the influence that one may have on the other.

Education can be the means by which students with disabilities overcome the stigma of their condition to integrate into society. By participating in inclusive educational settings, students engage the world as do their non-disabled peers, and have access to the social capital that can lead to educational degrees, which Bourdieu would call cultural capital or information capital (Bourdieu and Wacquant, 1992). As with the parent above who gained social capital through a parent group, the idea that their children had finished college was evidence of a powerful token of acceptance by society (Trainor, 2010b). This desire to overcome stigma and integrate in to society is not only a positive outcome, but also a powerful motivator according to Maslow's hierarchy of need. (Mansbach-Kleinfel, Sasson, Shvarts, and Grinshpoon, 2007). In their qualitative analysis of letters written by participants in a supported educational environment in Israel Mansbach-Kleinfel and colleagues captured the importance of this kind of acceptance

and the value of the educational process in helping this acceptance come about. The participants were students with psychiatric disabilities who were supported through Israel's Rehabilitation of the Mentally Disabled Act of 2000 that promoted the integration of the mentally disabled into the community. Through analysis of the letters, the authors noted a transformation from the role of patient to that of student, that is, a normalization of their roles to one more similar to their non-disabled peers and a change in habitus from changing their roles. As one of the participants noted in her letter, the education "allows me to integrate into the community with regular people". (p. 310) To the extent that the educational process can integrate students with disabilities into society it makes available the social capital which can allow them to attain their goals. Another participant letter contained an articulate expression of the feeling that many students with disabilities may share.

We, the disabled, live separate and different lives because of stigma or limited capabilities which bar us from normal social life. With the new tools and qualifications we have now got we get closer to healthy society, both in terms of knowledge and integration into the employment system...Now that I can access the Internet [because of the computer course] I feel part of the new and developing world, part of the world of healthy society. These tools allow the weaker population groups to re-connect to healthy society. (p. 311)

In this quote the student reveals a change in field and habitus. He is playing a different game with new cards, to follow Bourdieu's analogy. The new tools and qualifications are like cards that give him access to play in the world of healthy society.

Education can be an avenue for social capital for the students in a supported educational environment also. A practical question would be whether or not other educational supports can help overcome these difficulties for students with disabilities. Whitney, Langley-Turnbaugh, Lovewell, and Moeller (2011) examined a learning community specifically designed to facilitate the development of social capital for students with disabilities at the University of South Maine. The learning community was built around a course that the students took through the university, so the students had a formal relationship to their peers and to the mentors who were teaching the class. The class was designed to help with persistence to graduation for students with disabilities in college with a content focus on academic supports combined with self-determination skills to help explore STEM careers. The staff helped connect the students to opportunities for learning, such as finding a tutor for chemistry, and also helping them to complete the application process for internships. The students felt supported within the confines of the class and benefitted from the knowledge their instructors brought to them about possibilities in the university, but since this support took place in a separate environment, it may have cut them off from the type of social capital from peers that might have happened by joining any other student support group. However, to the extent that the program enhanced the willingness to look for social capital in others it provided real benefit. The students in the learning community did not report improved grades as a result of taking the class, but noted other benefits such as access to internships and effective learning resources, exactly the benefits of social capital that are desirable in education.



Students in both the supported educational system for students with psychiatric disabilities in Israel and the learning communities in Maine, identified inclusion with non-disabled peers as both useful in helping them attain skills and social capital as an end in itself through feelings of belonging and acceptance in society. Current reform efforts including No Child Left Behind (NCLB) and Individuals with Disabilities Education Act (IDEA) encourage higher rates of inclusion for students with disabilities in the general education environment (Roden, Borgemenke, and Holt, 2013) Social capital theory would predict that inclusion in the general education environment would lead to benefits for the individual students who were able to participate. In their analysis of standardized test scores in Texas, the increase of students participating in general education for more than 80% of the day had been accompanied by an increase in standardized scores for those students. I would argue that the benefit for the students is not simply exposure to the general education curriculum, but also through benefits of social capital as students form relationships with non-disabled peers, relationships with teachers of the content areas, and appropriation of attitudes and habits, habitus, of non-disabled peers. Social capital follows inclusion.

**Percent of college graduates as a measure of social capital.** Since forms of capital can be exchanged for one another, college degrees are an indicator of social capital in that can lead to financial rewards through employment in a skilled job. In this way, the cultural capital of the college degree can be exchanged for economic capital. For this study it can be useful to conceptualize the *field* of education in a community of being made up of players and coaches who play the game of education. The people who have college degrees have won the game in some ways, and their presence in a community

makes it richer in wisdom, advice, connections and attitudes in relation to education, that is, both in habitus that can be shared and cultural capital that can be a resource.

The number or percent of people with college degrees in a community is a measure of cultural capital that can be exchanged as social capital in three ways. First, it is a measure of those who have achieved a certain recognized attainment of cultural capital as defined by the degree requirements of the college. Furthermore, the college has met the standards of a regional body which oversees accreditation so that the degree conferred on the individual has widely accepted value as an indicator of cultural capital.

The second way that the percent of college degrees within a community is an indicator social capital involves Bourdieu's concept of habitus. For the purposes of defining a measure of social capital, the presence of people who have *won* the education game through a college degree means that there are more individuals with the necessary *habitus* that is geared to attaining this goal. Attainment of a college degree is designed to be arduous in the sense that it takes time to inculcate the individual with the knowledge and insights of education. For Bourdieu, this embodiment of the field, of education in this case, is an essential element of the attainment of cultural capital. (Grenfell, 2008) In a deeper sense, Bourdieu maintains that the person becomes an embodiment of the field saying, for example, "A scientist is a scientific field made flesh, an agent whose cognitive structures are homologous with the structure of the field, and, as a consequence, constantly adjusted to the expectations inscribed in the field." (as cited in Grenfell, 2008, p. 111) The habitus attuned to the accomplishment of this goal, the social structures supporting education and examples of this accomplishment are all, therefore, indicated by the percent of college graduates. It indicates the degree to which the *field* of education is

well developed and valued by the members of the community, as well as the advantages in that *field* possessed by the community in relation to other communities.

The third sense that the percent of college graduates in a community is an expression of social capital is as a resource in itself. If social capital is the sum of resources that accrue to an individual through relationships, then the example, advice and habitus of college graduates in a community is an available resource to students. In a study of social capital during transition from high school to work for students with disabilities, Trainor, Morningstar, Murray, and Kim (2013) report that students with disabilities often face barriers to social capital because of the disability itself. They are frequently taught in separate classrooms and often find that the stigma of the disability prevents access to social capital. The logic of including the percent of college graduates in a study is that having such people accessible in the community increases the possibility of children's acquiring social capital. The specific capital that college graduates can be assumed to have include all of those skills necessary to succeed in school. This capital might take the shape of skill in relating well with teachers and peers, skill in studying or even valuing education itself. Just as college students are inculcated with the concepts and skills of a field, so elementary students are inculcated with the concepts and skills associated with general education. Scores on standardized assessments become, in effect, a measure of cultural capital in the same way that a college degree is an indication of cultural capital. The two indicators of cultural capital, college degree and score on state assessments are parallel. They measure the same general field at different levels. While there is no way to directly conclude that the presence of more college graduates translate to more social capital depending on an individual's social connections, a higher

percentage of graduates in the community does increase the likelihood that the student will have greater access to that social capital.

### **Socio-economic Status**

Poverty has an effect on student learning, both in preparedness for entering school and achievement during school. (Balfanz, 2009; Berliner, 2009; Krashen, 2010; Washington, 2001) Some of the factors which cause difficulty in learning are environmental, such as exposure to lead, mercury or other pollutants. Mercury can cause nerve and brain damage in developing fetuses and children and, as a byproduct of industrial processes is found more often in poorer neighborhoods close to industrial sites. Lead also attacks the nervous system and is found in older housing stock which is often found in poorer communities. It can lead to diminished learning and behavioral problems which can impede learning. Polychlorinated biphenyls (PCBs) are similarly found more often in poor communities close to waste sites and can lead to difficulties in learning (Berliner, 2009)

Other physical factors that can impede learning for the poor include threats to health and food insecurity. Children born in poverty are more likely to have low birth weight, which can affect cognitive function. Berliner (2009) cites evidence that children of low birth weight have IQs about 11 points lower than the norm. (p. 19) Other threats to fetal health including diabetes, alcohol, methamphetamines, and cigarettes are more prevalent in poorer communities. Compounding these behavioral and environmental factors is the lack of access to health care which affects families of lower socio-economic status. Lack of health care can impede learning throughout the student's education. (Berliner, 2009, Krashen, 2011)

One of the basic physical needs that Maslow (1943a) specifically mentioned was the need for food. Like air for a drowning man, food to the hungry occupies the full attention, leaving little for the demands of academic learning. Hunger during the day makes it more difficult to concentrate, while malnutrition can lead to apathy and a decline in cognitive ability. Berliner (2009) cites evidence that children in families below the federal poverty level were 3.4 times as likely as their peers to be affected by food insecurity. About four million families were considered very low food security and in twenty percent of these or about 800,000 families one or more members of the family had nothing to eat on three or more days per month. Abraham Maslow (1943a) says that having undergone deprivation makes one experience the threat of deprivation more intensely than those who have never been deprived. If the deprivation and threat are extreme enough, he says that the person may live for safety from that threat alone. Similarly, he says, man does indeed live by bread alone, when there is no bread (Maslow, 1943a)

Families who are poor tend to be less likely to be able to prepare their children for school through pre-literacy skills and general oral language skills. (Krashen, 2011, Washington, 2001) Families who read to their children, introduce them to books and express an appreciation for books introduce their children to rules of language that benefit them in school. Julie Washington (2001) cites research that families will more likely read to their children if the mothers have higher levels of education and consist of a two parent household. Other research leads to the conclusion that most reading difficulties among lower SES children are “caused by insufficient preliteracy

experiences” (p. 216). Family practice in reading to children is an important factor in educational preparedness and success for students.

A corollary, and perhaps prerequisite, of reading to children is the presence of books in the home. Washington (2001) notes that much of the reading that takes place in lower income families is through print found in the environment such as signs and store labels rather than more traditional children’s books. For families that have access to books, it seems that the books themselves have a positive influence on children’s reading. Stephen Krashen (2011) cites research finding that having books in the home predicts reading achievement even when controlling for income, parental education, and other environmental factors. Furthermore, the number of books in the home predicts staying in school longer (p. 18)

These factors affecting lower income families have an effect on student achievement scores used as measures in school reform. Balfanz (2009) cites evidence that high poverty eighth graders demonstrate achievement roughly equivalent to an average fourth grader on the National Assessment of Educational Progress (NAEP) This trend of lower scores for lower SES is also found at the state level with the Missouri Department of Elementary and Secondary Education (DESE) reporting that 39.7% of students receiving free or reduced lunch were proficient on the English Language Arts (ELA) assessment compared to 59.7% overall (DESE, 2015a; DESE, 2015b).

**Lunch status as an indicator of socio-economic status.** Socio-economic status (SES) as indicated by lunch status is a dichotomous variable differentiating students who receive free or reduced lunch from those who do not. Skiba et al. (2005) argue for the legitimacy of using lunch status as a measure of SES saying that eligibility for the

program can be used because it is directly tied to family resources. Balfanz (2009) finds lunch status to be “notoriously inaccurate” since students often do not turn in the necessary forms, but agrees that lunch status is useful for establishing the lower bounds of the students who actually should be classified as lower socio-economic status. With that reservation in mind, lunch status was used as an indicator of socioeconomic status. SES played an important role in the model since it was the predictor at the student level affecting student outcomes. The effect of SES on MAP varied between districts each having a particular weight of the impact of SES on MAP. The model estimated the degree to which factors at the district level moderated that impact. A more complete description of the model will be discussed in the procedures section.

### **Threats to Safety**

Threats to safety have also been discussed in the literature as major factors inhibiting academic achievement (Basch, 2011; Carney, Jacob & Hazler (2011; Maslow, 1943a; Schwartz & Gorman, 2003). Perhaps Maslow (1943a) is most generally known for identifying physical safety as one of the most basic of human needs. As with physical need threats to safety predict a preoccupation with concerns that inhibit learning.

**Bullying as a threat to social capital.** Bullying is a particular form of violence which happens to an individual repeatedly over time by someone more powerful either physically or socially (Carney, Jacob & Hazler, 2011) The effect of the continuous threat of violence is a loss of the sense of safety that is important to self actualization according to Maslow’s theory (Mansbach-Kleinfel et al., 2007; Maslow, 1943b). Bullying can be part of the stigmatization affecting students with disabilities and can thus impede access to social capital and impact learning.

Bullying of students with disabilities can be different from other kinds of bullying. Holzebauer and Berven (1996) coined the term “disability harassment” for the type of harassment that is directed at an individual because of their disability. They noted that when researchers were defining racial harassment, they had turned to the language of federal statutes regarding sexual harassments and modeled their definition of racial harassment on the definition of sexual harassment. The authors, therefore, also looked at sexual harassment to help to define disability harassment. Accordingly, their definition sounds similar to definitions of sexual harassment.

Disability harassment is defined as the unwelcome bothering, tormenting, troubling, ridiculing or coercing of another person related of the disability of that person and is composed of verbal behavior or gestures as distinguished from physical violence or force. The harassing behavior is typically repeated and often takes place in a social context, with the harasser attempting to gain power over the individual being harassed. The determination of the occurrence of harassment belongs with the recipient, not with the harasser. (p. 478)

It is worth noting that in their formulation of the term, harassment does not include physical force, although other literature on bullying includes physical force. (Carney et al., 2011; Russell, Sinclair, Poteat, and Koenig, 2012) The authors noted through qualitative methods that victims of disability harassment often avoid environments where the harassment takes place, which separates them from the environment where they might find social capital and benefits such as employment. As early researchers in the field, they cited a lack of research on disability harassment, but noted that the effects of sexual



harassment included self-doubt, denial and self-blame, humiliation, anger, and depression.

More recently, Russell, Sinclair, Poteat, and Koenig (2012) analyzed data from the California Healthy Kids Survey of 2007-2008. The survey differentiated between different kinds of bias harassment based on sexual orientation, ethnicity, religion or disability. Students who reported that they had been victims of harassment, but not harassment related to a bias were included as a category of “general” harassment. Among participants who reported harassment, 40.3% reported bias harassment. Harassment related to disabilities was 6.5% the smallest segment of the sample. It is worth keeping perspective as we examine disability harassment to realize that there is a lot of harassment going on in the schools and disability harassment seems to be a small slice of the harassment. However, the small percentage reported here makes sense since students with disabilities are a minority of the population. The report calculated an odds ratio based on the total number of participants who did not report harassment against the total reporting harassment in each bias category. The 13 negative social and health outcomes included various types of substance abuse, various risky behaviors, truancy, absence, whether the student was threatened with a weapon, and whether the student had property damage. The odds ratio the authors calculated can be interpreted as students in bias category Y were X times as likely as students not reporting harassment to suffer effect Z. For example, we could interpret the results of the weapons threat as saying that students who were harassed because of their disability were 21.7 times more likely to have been threatened with a weapon than students who did not report any harassment. Similarly, students who reported bias based on disability were 4.1 times as likely as students not

reporting harassment to report binge drinking in the last month. In each of the 13 negative outcomes, students who were the target of disability harassment had higher odds ratios than any other bias harassment category. Although disability harassment was the smallest category of bias harassment at 6.5%, the effects of the harassment was more intense, having a greater effect on students than any other type of bias harassment. Future research might calculate an odds ratio for all students with disabilities compared to the general population on the experience of harassment so that we could know that students with disabilities are X times as likely as non disabled peers to experience harassment. It is clear from this research, that the effects of disability harassment have effects on behaviors and outcomes that threaten the ability of the student to engage in the school community in a way that would allow for healthy social capital network building.

Carney and colleagues (2011) specifically examined the effect of bullying on the social capital of middle school students. They operationalized social capital as something that accrues to an individual through relationships with others and is made up of beliefs about the trustworthiness, fairness, and helpfulness of others in society. This set of beliefs about the positive nature of others is a prerequisite for establishing those relationships that lead to Bourdieu's formulation of social capital. Using a survey of school bullying to establish the degree of exposure to bullying, either as a victim or witness, the researchers evaluated the correlation between exposure to bullying and the their three indicators of social capital. The results showed a significant difference between students who generally trusted others and those who did not on the scale of exposure to bullying. They also found significant differences between the groups who believed in the fairness of others and those who did not. In other words, students who were bullied generally trusted others

less, and felt that people were not fair. There was no significant difference between the groups of students who believed that people were generally helpful and those who did not. Given the vulnerability of students with disabilities to bullying, these results show that being bullied reduces trust in others which impedes access to social capital (Hartley, Bauman, Nixon & Davis, 2015).

Hartley and colleagues (2015) compared rates of bullying and victimization in general education and special education. The authors analyzed results from a survey of 13,177 students from 31 schools across 12 states and found that students with disabilities were about twice as likely as non-disabled peers to report daily physical harm, 22.6% to 11.4%. Daily emotional harm was also about twice as likely at 44.0% for students with disabilities and 22.6% for non-disabled peers. Consequently, students with disabilities report more chronic physical and emotional harm than non-disabled victims of frequent bullying. They hypothesized that bullying is by nature dependent on an imbalance of power, and students with disabilities, having fewer friends and lower self-esteem, are easy targets. While they did not calculate an odds ratio comparing students with disabilities to non-disabled peers for exposure to bullying, they cited evidence that 50% of students with disabilities experience bullying, compared to 20-30% of their non-disabled peers. They did, however, calculate an odds ratio for being physically hurt. Students with disabilities were found to be 1.41 times as likely to report being physically hurt by other students as non-disabled peers. The authors sound a note of caution for the policy of inclusion if inclusion is not implemented carefully. Inclusion can be a two edged sword which leads to greater integration of students with disabilities into the general population and reduces stigma through interaction with peers, but it also may

expose students with disabilities to harassment if they are not successfully integrated into the general school environment. Other researchers report that students with disabilities in inclusive settings have reported feeling “ostracized” (Carter & Spencer, 2006). For the benefits of social capital to flow to students with disabilities in such a way that they can develop valuable social networks, the problem of bullying and harassment must be carefully monitored.

**Office disciplinary referrals (ODRs) as a measure of threats to safety.** Safety of the environment, which according to Maslow is a critical factor in the learning of students can be measured objectively through ODRs (Carney et al., 2011, Prince & Howard, 2002). ODRs are an indication that the normal expectations of the school for behavior have been violated. In themselves, those violations of expectations of behavior are not threats to the individual student unless there is physical danger or the threat of physical danger. As noted above, students with disabilities experience bullying more often and are affected more by it than other students. Even when students with disabilities are not the victim of the bullying, the threat of bullying could be multiplied to all students of disabilities who witness bullying since they are more vulnerable to bullying than the general population of students (Hartley et al., 2015) It is difficult to measure the threat that students with disabilities may feel. It is even difficult to measure the bullying that they experience since we can assume that much bullying goes on unobserved by teachers. When office referrals for bullying are written, they are written for the one who has harassed or bullied the other student. Research has focused on the bully as the unit of analysis, rather than the victim (Preddy, McIntosh & Frank, 2014; Skiba, Arredondo &

Williams, 2014) Therefore, it makes sense to focus temporarily on the individuals who bully.

In a study of a population of incarcerated youths in Sweden, Wallinius, Billstedt, Anckarsater, and Hofvander (2016) examined a variety of psychosocial background factors and lifetime aggressive anti-social behaviors. Of all the factors they examined, the factor that explained the most variance in predicting incarceration was having bullied others ( $R^2 = .11$ ) These results imply that bullying is a characteristic behavior of those individuals who are likely to violate social expectations for behavior. While not all students who bully others will go on to be incarcerated, there is a correlation between out of school suspensions resulting from ODRs and incarceration (Skiba et al., 2014)

Evidence indicates that bullying behavior is a predictor of high numbers of ODRs for the student who bullies. In an analysis of predictive factors for chronic problem behavior Predy, McIntosh, and Frank (2014) examined factors from early in a school year that would lead to a high number of ODRs by the end of the year. They looked at two groups; (a) those with two to five ODRs by the end of the year and (b) those with six or more ODRs. In calculating odds ratios (ORs) for each group they found that students who were referred for harassment or bullying were at significantly higher risk of having high ODRs by the end of the year. Students who were referred for bullying early in the year were 1.67 times more likely to be in the group with 2-5 ODRs and 1.36 times likely to be in the group with six or more ODRs by the end of the year than their peers. Both of these statistics were significant at  $p < .01$ . Therefore, we can conclude that students who bully are likely to contribute more to the total ODRs of a group than others. More bullying means in general more ODRs, that is, beyond just the number of bullying ODRs.

The link between ODRs as a predictor for bullying is more closely examined in a study of disciplinary records in 6<sup>th</sup> and 8<sup>th</sup> grades. Tobin and Sugai (1999) selected disciplinary records for violent behavior, harassment, non-violent misbehavior, and grade point average from students sixth grade in order to predict a variety of discipline problems in the 8<sup>th</sup> grade including bullying and harassing. Because the 6<sup>th</sup> grade predictors were highly inter-correlated for the model predicting bullying and harassing in the 8<sup>th</sup> grade, they selected just one factor, violent behavior, to represent all of the 6<sup>th</sup> grade ODRs . The result of their analysis showed that their model of 6<sup>th</sup> grade ODRs explained 25% of the variance in predicting that a student would receive an ODR for harassment or bullying, Since the indicator which had been used to represent all of the inter-correlated factors of sixth grade predictors was statistically significant at  $p < .001$  it is reasonable to conclude that ODRs in the sixth grade predicts bullying behavior in the 8<sup>th</sup> grade.

Finding a broad measure for threat to safety is difficult because of the variety of situations a student may feel threatened. That being said, it is possible to make some observations about the relationship between ODRs and threats to safety, especially bullying which can clarify the relationship. Since research shows that individuals who are incarcerated for breaking laws have a tendency to have bullied others (Wallinius et al., 2016) and students who have a high number of ODRs have tended to bully others (Predy et al., 2014) I can state that over a large distribution of student offenders who receive ODRs, a significant proportion is from those who have bullied others. Also, since students who have received ODRs for bullying tend to have already received a significant number of ODRs from all sources (Tobin & Sugai, 1999) there is an indication that large

numbers of ODRs predict bullying behavior. Since students with disabilities experience more bullying than others (Rose et al., 2000; Hartley et al., 2015) then the proportion of victims of bullying in the distribution of ODRs is higher for students with disabilities. Consequently, the rate of ODRs in a school district can be taken as a measure of bullying. Beyond bullying, a high rate of ODRs implies a more chaotic and threatening environment for students with disabilities. As the rate of ODRs goes up the perception of safety goes down. For this study, incidents per 100 students reported to the state Division of Elementary and Secondary Education (DESE) will be considered an objective measure of the construct of threats to safety.

### **MAP Scale Score as an Indicator of Student Learning.**

The dependent variable for this study will be the Missouri Assessment Program's (MAP) scale score centered on the proficiency level for the appropriate grade. This score is used to calculate the MAP achievement level. The achievement level is a four level achievement scale that meets the requirements of the federal reporting standards for state reporting of assessment data at four levels (Chudowsky & Chudowsky, 2009). Generally the levels correspond to (a) not meeting the standard (b) approaching the standard (c) meeting the standard, and (d) exceeding the standard. The corresponding MAP achievement levels are (a) below basic (b) basic (c) proficient, and (d) advanced (DESE, 2014). The scale score is a continuous variable that is more sensitive to student progress than the achievement level. For example, scale score allow differentiating between scores of students who may all be in the "Basic" achievement level. Since students in different grade levels have different expectations the scores were centered on the scale score of proficiency for the appropriate grade. The proficiency centered score was calculated by

subtracting the cut score for proficiency from the student's scale score. The result was the deviation or distance from that score to the cut score, thus making it a deviation score (Tabachnick & Fidell, 2007). The centered scores allow combining all scores across grades for use in the model. Since the score is a deviation from the proficiency score for that assessment and that grade, the centered score preserves the information for how the student score can be compared to other scores which are similarly calculated as deviance from that proficiency score. Consequently the centered score allows information to be preserved that would have been lost if I had only used the four categories of the achievement level.

### **Hierarchical Linear Modeling (HLM)**

One of Urie Bronfenbrenner's (1979) basic concepts may seem self evident, that individuals grow and learn in an ecology of nested environments. Like a Russian doll, each environment, from family to the larger community occur within and are affected by the surrounding structures. This nesting has a particular effect in that students learn within classrooms, taught by a teacher having individual characteristics, within schools with specific climates, within communities with specific characteristics. The students within a given classroom share in common the impact that their teacher's individual teaching style brings. A classroom in the same school will have students who share the impact of their own teacher. Classrooms across the region will have similar shared and different influences which derive from the characteristics of teachers, schools, and communities. To analyze student learning without bringing these factors into account can lead to erroneous conclusions. Yet until recently, it was difficult to build models with multilevel factors (Kreft & de Leeuw, 1998).



**Previous approaches to analyzing multilevel data.** One approach to modeling student learning is simply to ignore group membership. However, as Adcock and Phillips (1997) point out, students are not distributed randomly between schools, or in this case, school districts. Data that are clustered in this way, that is, where students in one district are more similar to each other than students across districts, lead to residuals that are not normally distributed. Although this violation of assumptions of regression does not affect the estimates of regression coefficients, it does lead to errors in significance testing (Cohen, Cohen, West & Aiken, 2003). If multiple linear regression were used to predict MAP scores from demographic variables the assumptions of independence of observations would be violated when student factors are included in the equation since many students would share information related to their school. For example, if there were a factor of school climate included, then all of the students in that school would have the same value for that variable.

Another approach is to simply analyze data at the school or district level. This aggregation of the individual data in order to model data with group means, ignores the individual variation between students thereby weakening the analysis by ignoring the information included in those variations (Bryk & Raudenbush, 1992; Woltman et al., 2012).

**Advantages of HLM.** HLM provides three significant advantages for analyzing multilevel data. First, it allows improved estimation of effects within grouped data by including information to consider from similar groups. Bryk and Raudenbush (1992) give the example of business schools who were having trouble developing an equation for minority students based on several factors that might be more fair than their existing

equation, developed when the schools were segregated. However, no school had adequate numbers of minority students to develop a meaningful relationship between their predictive factors and student outcomes. All of the minority students could have been aggregated together to estimate a relationship, but this aggregation would have lost significant information about the way individual students performed within schools which were often very different. HLM provided a solution by “borrowing strength” from the information in other similar schools to provide an equation appropriate for each school.

A second advantage is that HLM allows for testing theories about how variables at one level affect the influence of variables at another level. For this study, HLM allows equations to be formulated with both student level and district level variables and test hypotheses involving the impact of community level social capital on the relationship between individual level lunch status and individual achievement scores.

Finally, HLM allows for estimation of variance and covariance components of nested data. This partitioning of the variance allows the determination of the proportion of the variance that is due to within district effects and between district effects (Bryk & Raudenbush, 1992). Whereas multiple regression, with some of the aforementioned problems mentioned above, could be written to predict individual achievement scores, all of the variance due to individual and district level influences would be combined into one error term. With HLM It is possible to estimate error terms for the individual student within a given district; an error term for the intercept, or mean of each district; and an error term for the slope of the impact of SES on student scores for each district. This partitioning of the error into multiple components allows us to make observations about

the varying relationships between variables across multiple districts and test hypotheses about those relationships.

**HLM as regression.** When approaching an understanding of HLM it is important to be reminded, as Robert Bickel (2007) says, that HLM is “just regression.” HLM extends simple regression across multiple levels, but the logic of regression holds true as the basic engine of analysis. For illustrative purposes, it is worthwhile to review some of the notation and logic of regression as an introduction to HLM.

Linear regression predicts a value for a dependent variable when the value for an independent variable is known. If the world were predictable and mathematical without error this relationship would be a simple geometric equation of a line taking the form

$$\text{Dependent variable (y)} = \text{The intercept} + (\text{the slope of the line}) (\text{the value of the independent variable(x)}).$$

In other words given the value of  $y$  when  $x = 0$ , which is the intercept, we can calculate the value of any  $y$  by multiplying the value of  $x$  times the regression coefficient, which is the slope of the regression line in this case. However, the regression line is just the best fit for the data in the data set. For each data point there is an error which is the difference between the predicted value, represented by the line, and the actual value. The error is equal to the distance from the point of the actual occurrence of the data to the regression line. The aggregation of these errors for all of the points in the data set is the residual error term. The error term is a measure of the variance which is of critical importance for hypothesis testing in HLM.

**Model equations.** The level one equation for one variable resembles a regression equation, with the addition that the subscripts indicate the student level data as student “ $i$ ”

in district “ $j$ ”. Where a simple regression equation with one variable could be of the form  $y = \beta_0 + \beta_1x + \varepsilon$  in which the dependent variable  $y$  is predicted by the overall intercept or mean  $\beta_0$  modified by the effect of independent variable  $x$  plus the individual error term  $\varepsilon$ . A simple regression equation would be appropriate for a single setting such as a school district. In order to use the same regression in multiple districts it is necessary to add indicators to identify which student in which district is being referenced. In the following equation, the subscript  $i$  refers to the  $i^{\text{th}}$  student and  $j$  refers to the  $j^{\text{th}}$  district.

The equation would therefore appear as

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij}) + \varepsilon_{ij}$$

The logic of this notation is as if one were to count all of the students from 1 to the last student ( $i$ ) in school ( $j$ ), then count all of the students from 1 to the last student( $i$ ) in school 2 ( $j$ ) and continue on until all of the students in all of the schools had been counted. In this example the score of 23<sup>rd</sup> student in the 4<sup>th</sup> school would be  $Y_{234}$ .

Although this study did not examine individual scores, the statement of the equations with this notation allows us to evaluate the relationships between predictors at multiple levels. This notation also allows the identification of specific slopes, intercepts and error terms at multiple levels, although for this study there were only two levels.

**Centering and interpretation of the intercept.** The interpretation of the intercept in the Level-1 equation is affected by the centering method chosen (Bryk & Raudenbush,1992; Hoffmann, 1997; Woltman et al.,2012). In simple regression, the intercept is the value of  $Y$  when  $x = 0$ . In some cases, it makes sense to have a zero value for  $X$ , such as speed = 0 for an object at rest. However, it would make no sense to say

that the height of a person was zero. Bryk and Raudenbush suggest that there are four possibilities for the location of the Xs through centering at Level-1.

The first option is not to center the data at all, but to keep the original value of X. This option is dependent on a meaningful zero value for X. the second option is grand mean centering. Centering around the grand mean involves subtracting the grand mean of all values of X from each value of X. Thus the equation of Level-1 would be

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - \bar{X}) + \varepsilon_{ij}$$

Where  $\bar{X}$  is the grand mean of all values of X. With grand mean centering the value of  $\beta_{0j}$  becomes the outcome value for a participant whose value for  $X_{ij}$  is equal to the grand mean. The intercept can be interpreted as an adjusted group mean for group j. A third possibility locating the Xs is through group mean centering. With group mean centering, it is the mean X value for the group, rather than the grand mean of all Xs that is subtracted from the values of x. This method of centering is represented in the following equation.

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - \bar{X}_j) + \varepsilon_{ij}$$

The last option for locating the Xs is to select another specialized choice which has a theoretical implication for the research other than these choices (Bryk & Raudenbush, 1992). As discussed above, the dependent variable was the MAP scale scores centered on the proficiency cut score for the appropriate grade. SES was not centered at Level-1, but the Level-2 predictors were both centered on the grand mean and grand slope.

For this study, the Level-1 predictor was SES which is a dummy variable with 1 = full pay lunch status and 0 = free or reduced lunch status. This structure of the variable

yielded an interpretation of the intercept  $\beta_{0j}$  as the value for a student who receives free or reduced lunch, since the study is interested in the effects on students in economic need.

### **Conclusion**

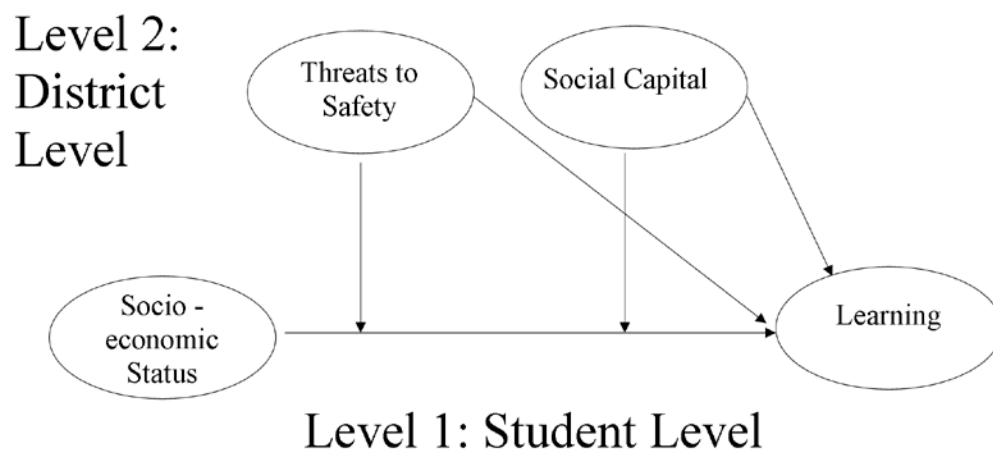
Social capital, threats to safety, socio-economic status can affect the learning outcomes for all children. Students with disabilities are affected by all of those trends, as well as additional challenges resulting from their disability. They have additional challenges when their disability makes it more difficult to communicate with peers and teachers. This difficulty in communication affects their ability to form social relationships, which makes them less likely to benefit from social capital. The stigma associated with disabilities can lead to ostracism and bullying which can make them less willing to believe that others are trustworthy and fair. This lack of trust of others may lead them into alienation and isolation. Isolation is in fact imposed on them when the special education takes place in separate environments. However, these difficulties with social capital should not lead us to ignore the effects of social capital on students with disabilities. Rather, if the benefits of social capital are the oxygen that lead to essential skills and inclusion in society, then its effects on students with disabilities should have even greater priority than with the general education population. The study of social capital and students with disabilities has promise to facilitate success as they learn in school and transition to inclusion as citizens in society.

**Research questions.** The questions driving this study were: How does socio-economic status affect learning of students with disabilities? How do social capital and threats to safety affect learning? How do social capital and threats to safety moderate the relationship between socio-economic status and learning? To answer these questions, I

built a two level model with student level information at Level-1 and school district information at Level-2. In the following diagram, the ovals represent the theoretical constructs that were used in the calculations.

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## Two Level Model of Factors Affecting Learning



*Figure 1* Two level model of factors affecting student learning.

**Hypotheses.** The specific hypotheses that were tested in this model include:

H1 Socio-economic status affects learning.

H2 Social capital affects learning.

H3 Threats to safety affect learning.

H4 Social capital moderates learning.

H5 Threats to safety moderate learning.

While there have been many researchers who examine the effect of social capital and threats to safety on outcomes of students with disabilities, there is a gap in the literature researching the interplay of these factors in a multilevel model, which is more appropriate to the nested environments of students within communities. If social capital affects the impact of socio-economic status on learning of students with disabilities, then that knowledge could inform educational policy. Similarly, if threats to safety affect that relationship, then that information could be used to inform policy for placement and supports for students with disabilities. Any insights gained into how to help students with disabilities succeed are well worth the effort.

### **Methodology**

The purpose of this analysis was to build and test a model of student achievement that incorporated measures of student need at the student level, and measures of social capital and safety at the group level. In this section the characteristics of the subjects, the measures used in the study, and the procedure for building and testing the model will be discussed. In the discussion of procedures the reasoning for the selection of Hierarchical Linear Modeling (HLM) will be elaborated. In the final segment I will describe the procedures for building and testing the model. Since accurate model building depends on testing the data to see what factors are appropriate, the process for determining the final model will be discussed at the end of this chapter.

### **Participants**

Archival data were used for this study. The subjects in this study were students with disabilities who received services through the local special education service



provider. The special education provider for all of the districts in this study is a single institution organized as a school district to provide special education services. This district serves over 23,000 special education students throughout the region. Since this district provides services to all special education students in all of the school districts in this study, it is an important control for quality of services. Differing quality of services would have been a powerful confounding variable in this study were it not for the single source for the provision of services that the district provides. Although there is probably variance in the quality of services provided, the central guidance and support provided by the single service provider minimizes those differences.

Of the students with disabilities, only those taking the regular state assessment were included in this study. Due to state testing policies, only students in grades 3–8 were included since first and second graders are not tested, and testing in grades 9-12 employs separate content based assessments (Missouri Department of Elementary and Secondary Education, 2014).

The setting of the study is a large county in Missouri having a mixture of urban and suburban school districts. According US census data the total population of the county is roughly one million with a per capita income of approximately \$36,500 and a poverty rate of approximately nine percent.

Since this study examined the assessment scores of students with disabilities, it was necessary to describe the structure of assessment types in relation to this study. Federal legislation allows for three types of assessment for students with disabilities. The students with the most severe cognitive disorders may take an alternate assessment with alternate standards, rather than grade level expectations. At the other end of the spectrum,

students with disabilities take the regular state assessment. The Department of Education allowed states to develop a third assessment between these two extremes which would be aligned to content standards for each grade, but could be less difficult than the grade level expectations. As of 2009, only eight states were using this third category of assessment and Missouri was not one of them (Chudowsky and Chudowsky, 2009). This study included only scores of students with disabilities who took the regular state assessment of English Language, not an alternate assessment.

### **Measures**

**Missouri assessment program (MAP).** The dependent variable for this study was the English Language Arts MAP scale score centered on the proficiency cut score for each grade as described in chapter 2. Essentially, the MAP score used in calculations was the number of points away from the proficiency cut score for the appropriate grade. For this study the English Language Assessment scores were used since language is not only a gateway to other content, but relates to communication which is important for social capital.

**Socio-economic status (SES).** The SES indicator was lunch status as a dichotomous variable differentiating students who receive free or reduced lunch from those who do not. This variable was coded with 1 for students who do not receive free or reduced lunch and 0 for students who receive free or reduced lunch. SES was an independent variable at Level-1 of the model, the student level.

**Social Capital as percent of college graduates.** Percent of college graduates in the school district community was used as a measure for social capital. This variable was an independent variable at Level-2 of the model, the school district level.

**Threat to safety as rate of discipline referrals per hundred students.** The rate of discipline referrals per hundred students was used to measure threats to safety in the environment. Discipline rate were an independent variable at Level-2 of the model, the school district level.

### **Procedures**

**Data collection.** Student level data were taken from a student test file which includes demographic data and assessment results that was provided by the Missouri Department of Elementary and Secondary Education (DESE) to the institution that provides services to students with disabilities throughout the county. The fields taken from this file included grade, free or reduced lunch status, MAP scale score, and school district. The file contained no personally identifiable field.

School district level data for percent of population with college education was obtained through US Census sites. The percent of people with college degrees or higher was taken from the National Center for Education Statistics EDGE site. (NCSE, n.d.) Total population for 2010 was selected leading to the table finder. School District was selected for geography type and Missouri selected as the state. Then each school district in the county was selected iteratively from table B15003 Educational Attainment for the populations 25 years and over.

Disciplinary data was taken from the Missouri Comprehensive Data System website at <https://mcds.dese.mo.gov/Pages/default.aspx>. By selecting “District Info”, selecting the school district and clicking on Disciplinary Incidents by District, the data can be downloaded as a comma separated values document which can be opened as a spreadsheet for the year in question.

## Research Design

The research design for this study will be a Hierarchical Linear Model (HLM) also referred to as Multilevel Linear Modeling (Bryck & Raudenbush, 1992; Tabachnik & Fidell, 2007). The model incorporated existing data in which the subjects were not assigned randomly to groups, but rather by existing school districts. The data is archived in educational and census databases. In this model students were grouped into school districts with the dependent variable, student achievement, at the student level and indicators of social capital and threat to safety at the district level. There was no active intervention, but rather the effects of independent variables at each level on the dependent variable were estimated with HLM software.

As discussed in the previous chapter, the structure of the model depends on the definition of several model equations. The equations specified the variables and the relationship between them to calculate values that were then tested for significance in order to test the hypotheses. The first equation to consider in this study is

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{ij} + \varepsilon_{ij} \quad (1)$$

To avoid redundancy, the specifications of each variable will be included in the results section.

At Level-2 the equations were regression equations in which the dependent variables were the mean and slope for the  $j^{\text{th}}$  district as influenced by the Level-2 variable. The final model had two level two predictors: percent of the district population with a college degree and the number of disciplinary incidents per hundred students. For simplicity this equation will only specify a model for percent of college graduates in the community. An equation for calculating the intercept of the relationship between the

variable and the outcome used the grand mean of all district scores, the regression coefficient for the variable over all districts, and an error term in basic regression format. In other words, the grand mean provided the reference point which is modified by the district slope and the value of the variable for that district to provide the predicted value. The error term for that district is the variance from that predicted value. The equation for the intercept of the district with respect to the variable is

$$\beta_{0j} = \gamma_{00} + \gamma_{01}Z_j + U_{0j} \quad (2)$$

The equation for the slope of the relationship between SES and MAP score for each district is similar in that it uses the grand slope as the starting point, the overall regression coefficient of the variable in relation to the slope and the value of the variable for the district to predict a value for the slope. Therefore the equation for the slope of the relationship for each district is

$$\beta_{1j} = \gamma_{10} + \gamma_{11}Z_j + U_{1j} \quad (3)$$

### **Hypotheses, Necessary Conditions and Testing**

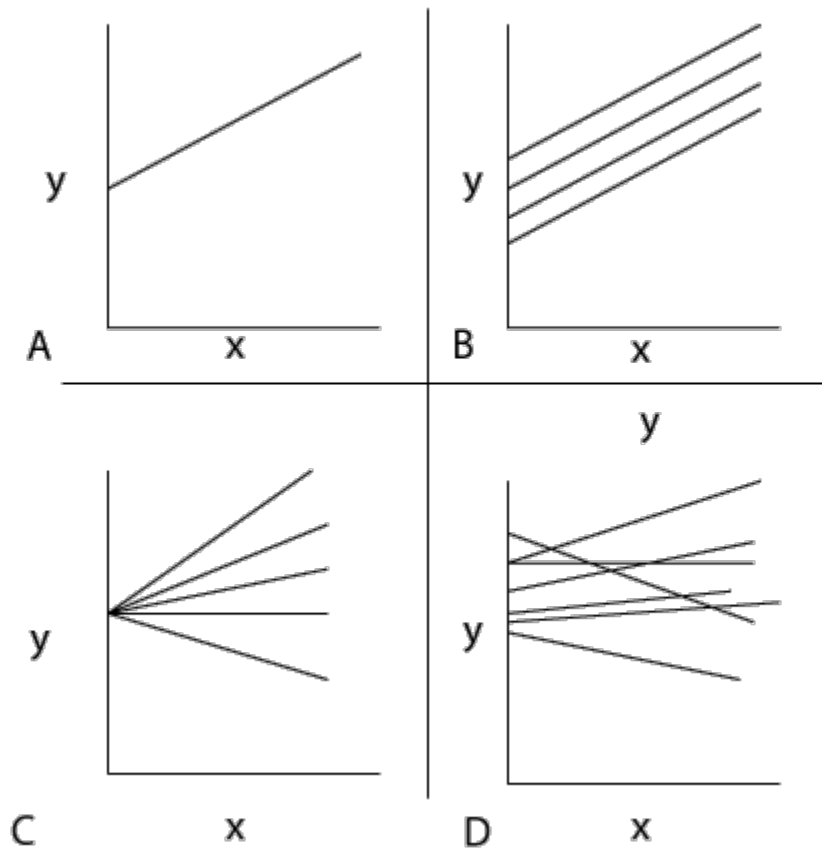
Hypotheses tested in this study were whether social capital and safety in a community affect standardized scores for students with IEPs and whether these factors affect the relationship between socioeconomic status and standardized scores.

Conceptually, I wanted to examine how the lunch status of students affects the MAP score at the Level-1. The research questions guiding the model were whether social capital and safety affected that Level-1 relationship. In order to test these questions several requisite conditions were determined, such as, is there any systematic variance between school districts at all on MAP scores? If there is not, then the hypotheses fail, since there is no significantly varying relationship between districts at all. In the

following section, the hypotheses will be stated in terms that can be tested, and the requisite conditions for confirming the hypotheses will be specifically identified. Finally, the strategy for testing each of the conditions in HLM 7 software will be elaborated. HLM provides some basic tests of significance by default. These include a t-test for fixed effects and chi-square tests for significance of residual variance at level two. Hoffman (1997) says that these basic tests should be enough for most purposes. This study relied exclusively on those tests.

The proposed hypotheses include two predictors at Level-2, the district level: percent college and rate of disciplinary incidents. Bryk and Raudenbush (1992) suggest that ten observations are required to support the inclusion of each predictor. Since there were 22 Level-2 units, the minimum number for two variables is met. In order to proceed conservatively, the hypotheses which involve rate of disciplinary referrals were only added if significance tests for variance indicate that more variance remains to be explained as will be noted in the process below.

It is worthwhile to examine a graphic representation of the data in order based on a design by Hoffman (1997) to clarify the model building used to test the hypotheses.



*Figure 2* Four possible patterns for intercepts and slopes when Level-1 models are estimated separately for each group. (p.727)

The first condition to be tested is whether or not there are significant differences within groups and between groups. Section A in figure 1 shows a result in which the school districts have neither significant differences between their means, indicated by their intercept with the x axis, nor between the relationship between SES and MAP score, indicated by their slopes. Since these differences are not significant, I can represent the districts as a single line, so the relationship between SES and MAP score is constant between districts, and they all have the same mean score.

If the test for between group variance is significant then the result would be depicted in section B of figure 1. The lines for the districts intercept the x axis at different points indicating significant differences between their means. Notice that in the figure, the lines representing the districts are shown to be parallel, because we have not tested for significant differences in slopes of the relationship between SES and MAP scores. In this case I would be able to test for significance of the impact of the Level-2 variables on the mean scores, but not for their influence on the relationship between SES and MAP.

In section C of figure 1, the districts are depicted as having the same mean outcome, represented by the single intercept with the x axis, but the relationship between the independent variable (SES) and the dependent variable (MAP) is significantly different. In other words, the districts have different slopes representing the relationship between SES and MAP scores. In this case I could test for the impact of the Level-2 variables on the relationship between SES and MAP, but not on the overall mean of MAP scores.

Section D of figure 1 shows the districts as having different mean MAP scores, represented by different intercepts, and different relationships between SES and MAP, as represented by the different slopes of the lines. If I find that the districts have significant differences in intercepts and slopes, then this section best represents the districts, and I will be able to test for the effects of the Level-2 variables on both the intercepts and slopes.

Although these figures do not replicate the stages of the testing outlined below, they illustrate the effects of significant differences of intercepts and slopes. The stages of



testing will determine if these significant differences exist. Further tests will determine whether these significant differences are explained by the Level-2 variables.

Model building proceeded sequentially so that each of the requisite conditions could be evaluated in order. The general stages of model building start with one way analysis of variance to determine the fixed effects, within group variance, and between group variance. Fixed effects refer here to the Level-2 grand mean,  $\gamma_{00}$ , and the grand slope,  $\gamma_{10}$ . Next a random coefficient model was tested to determine if there were significant differences between groups in terms of mean achievement scores and the slope of the influence of SES. If there were no significant differences between districts then there would have been no need to continue with the analysis. In the third stage I examined a model of intercepts as outcomes to determine if the variance between groups was significantly related to percent college and office referral rate. Finally, a model of slopes as outcomes was examined to see if the requisite conditions were met to establish that the Level-2 variables moderate the relationship between socioeconomic status and test scores.

**Hypotheses.** The following hypotheses guided the analysis of the data.

H<sub>1</sub> Socio-economic status (SES) is significantly related to MAP scale score.

H<sub>2</sub> Percent college is positively related to MAP scale score after controlling for SES and the effect will be positive. (In other words, students in districts with higher percent of college graduates will score higher on MAP after controlling for SES).

H<sub>3</sub> Percent College moderates SES to MAP relationship and the effect will be negative.

In other words, in districts with a higher percent college, the impact of SES on MAP will be less.

H<sub>4</sub> Discipline rate is negatively related to MAP after controlling for SES. In other words, students in districts with higher incident rates will score lower on MAP after controlling for SES.

H<sub>5</sub> Discipline rate moderates SES to MAP relationship. In other words, in districts with a higher discipline rates, the impact of SES on MAP will be more.

**Requisite conditions for confirmation of the hypotheses.** In order to determine if the hypotheses are warranted, the following requisite conditions had to be met.

1. There are systematic variances in MAP scores within and between school districts.

If there is no systematic variance within the groups, then there is no reason to model the effect of SES on MAP. If there is not significant variance between groups, then there is no reason to model percent college or discipline rate.

2. There is significant variance in the Level-1 intercept.

If there is no significant variance between districts on MAP scores, then there is no reason to examine differences between them.

3. There is significant variance in the Level-1 slope.

If there is no significant variance in the slope of SES on MAP, then neither percent college nor discipline rate can moderate that relationship.

4. Variance in the intercept is significantly predicted by percent college in districts.

If the variance in intercept, that is, mean MAP, is not affected by percent college, then it does not add anything to the model in terms of explained variance.

5. Variance in the slope significantly is predicted by percent college in districts and the effect will be negative.

If variance in the slope is not predicted by percent college, then it has no effect on the SES to MAP relationship.

6. Variance in the intercept is significantly predicted by discipline rate.

If the variance in intercept, that is, mean MAP, is not affected by discipline rate, then it does not add anything to the model in terms of explained variance.

7. Variance in slope is significantly predicted by discipline rate

If variance in the slope is not predicted by discipline rate, then it has no effect on the SES to MAP relationship.

**Strategy for testing conditions.** The following steps or stages were taken in order to determine if the requisite conditions were met.

**Stage 1 one-way analysis of variance.** This stage partitions the variance of MAP scores into within and between group variances. The two equations which define the two level relationship are as follows.

$$\text{Level-1} \quad MAP_{ij} = \beta_{0j} + r_{ij}$$

$$\text{Level-2} \quad \beta_{0j} = \gamma_{00} + U_{0j}$$

The clarification of each variable will be made in the results section to avoid redundancy. In other words, terms like  $\beta_{0j}$  as the mean of district J will be enumerated in the appropriate section of the results.

In these equations there are no predictors so the HLM program estimates the values by regressing on the unit vector (Hoffmann, 1997) This calculation forces the variance within groups into the Level-1 residual,  $r_{ij}$ , and the between group variance into the Level-2 residual,  $U_{0j}$ . HLM software provides a t-test for the significance of the between group variance at this point. The significance of the within group variance was

tested in the next stage. At this level the interclass correlation (ICC) can be calculated by dividing the between group variance by the between group variance plus within group variance.

$$\text{ICC} = \frac{\tau_{00}}{\tau_{00} + \sigma^2} \text{ or } \text{Var}(U_{0j}) / \text{Var}(U_{0j} + \text{Var } r_{ij})$$

The ICC indicates the proportion or percent of total variance due to between group variance.

**Stage 2 random coefficient regression model.** If the t-test for variance between groups were significant, then I could proceed to the next stage which tests for significance of variance for the intercepts and slopes between districts. Significant variance in intercepts would help support Hypothesis 2 and significant variance in slopes would help support Hypothesis 3. Significance at this stage is necessary for these hypotheses, but not yet sufficient.

The random coefficient regression model is specified by the following equations.

$$\text{Level-1 } MAP_{ij} = \beta_{0j} + \beta_{1j}(SES_{ij}) + r_{ij}$$

$$\text{Level-2 } \beta_{0j} = \gamma_{00} + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + U_{1j}$$

At this stage, HLM provides a t-test for significance of  $\gamma_{00}$  and  $\gamma_{10}$  indicating whether they are significantly different from zero. If  $\gamma_{00}$  is significantly different from zero, this means that there is significant within group variance necessary to confirm Hypothesis 1. Since  $\gamma_{10}$  is the mean of the slopes, or district relationships between SES and MAP, then significant variance means that there is significant relationship between SES and MAP.

At this stage HLM also provides a chi-square test of the variances  $\tau_{00}$  and  $\tau_{11}$ . If significantly different from zero, they indicate that there is significant difference in the means and slopes of the districts in relation to SES, thus meeting requisite conditions 2 and 3. HLM also provides an estimate of residual variance after accounting for SES for the level one equation,  $\sigma^2$ . Since the value of  $\sigma^2$  in the ANOVA stage gave an estimate for total within group variance for MAP, I could use the residual of the random regression model to calculate  $R^2$  for the proportion of variance accounted for by SES

$$R^2 = (\sigma^2_{\text{oneway ANOVA}} - \sigma^2_{\text{random regression}}) / \sigma^2_{\text{oneway ANOVA}}$$

(Hoffman, 1997; Woltman et al., 2012).

**Stage 3 intercepts as outcomes.** Establishing that there are significant differences in intercepts between districts, allows proceeding in this stage to test whether this difference is significantly related to percent college. In the intercepts as outcomes stage, I introduced a Level-2 predictor, percent college, into the equation at Level-2 to test condition 4. The model at this stage was as follows.

$$\text{Level-1 } MAP_{ij} = \beta_{0j} + \beta_{1j}(SES_{ij}) + r_{ij}$$

$$\text{Level-2 } \beta_{0j} = \gamma_{00} + \gamma_{01} (\%College) + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + U_{1j}$$

In this stage the t-test for  $\gamma_{01}$  is a test for hypothesis 2 that percent college is related to MAP after controlling for SES. In this stage I tested whether enough variance remains after accounting for percent college at Level-2 to support the inclusion of another Level-2 predictor. When the chi-square test for  $\beta_{0j}$  indicates that it is significantly different from zero after accounting for percent college, then I proceeded with testing hypotheses 4 and 5 by adding discipline rate to the model. Also, in the same way that I

was able to calculate an  $R^2$  value for the percent of variance attributed to SES in stage 2, I could calculate the  $R^2$  value for the percent of variance attributable to percent college.

*R<sup>2</sup> for level 2 intercept with %College*

$$= \frac{(\tau_{00_{randomRegression}} - \tau_{00_{interceptsasOutcomes}})}{\tau_{00_{randomRegression}}}$$

**Stage 4 slopes as outcomes.** In this final stage I tested whether the percent college affects the relationship between SES and MAP scores. In this stage I introduced percent college as a predictor in the calculation of the slope at Level-2. The test of the residual for this equation indicated whether or not hypothesis 3 could be confirmed. The equations for this model are as follows.

$$\text{Level-1 } MAP_{ij} = \beta_{0j} + \beta_{1j}(SES_{ij}) + r_{ij}$$

$$\text{Level-2 } \beta_{0j} = \gamma_{00} + \gamma_{01} (\%College) + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} (\%College) + U_{1j}$$

The t-test for  $\gamma_{11}$  is a direct test of hypothesis 3 that percent college will moderate the relationship of SES to MAP. If established, this would be a cross-level interaction between a Level-2 predictor and a Level-1 predictor. In this stage also, I was able to calculate an  $R^2$  value for the percentage of the variance in the SES to MAP relationship that was attributable to percent college. Since the  $\tau_{11}$  value calculated for intercepts as outcomes represents the total between group variance in slopes I could subtract the residual variance of slopes as outcomes and divide by the variance of intercepts as outcomes to yield the total amount of variance in slope due to percent college.

$$R^2 \text{ level} - 2 \text{ slope} = \frac{(\tau_{11_{interceptsasOutcomes}} - \tau_{11_{slopesasOutcomes}})}{\tau_{11_{interceptsasOutcomes}}}$$

If the data warranted, the predictor of discipline rates was included in the model and tested as percent college was tested above.

### **Model Robustness**

Opinions vary among practitioners using HLM concerning the effect of the number of records needed for adequate power. (Bryk & Raudenbush; 1992, Maas & Hox, 2004; McNeish & Stapleton, 2018) This concern rests primarily on the Level-2 units, or clusters, since logically there are always fewer groups than there are individual cases. Having too few clusters can result in the variance and standard errors of the Level-2 equations being estimated at too low a level. This lowered estimation of variance and of standard errors may make the model look more accurate and more appropriate than it really is. It is worthwhile to review some of the literature on this point to determine the adequacy of the model with the available data, possible corrections, and cautions for interpretation of the results.

Bryk and Raudenbush (1992) offer the rule of thumb that there should be ten Level-2 units for each parameter estimated. By this rule of thumb, the proposed model for this study would be underpowered since four parameters are estimated in the final model. In such a case, Bryk and Raudenbush warn that the variance estimates and standard errors at Level-2 will be underestimated. Maas and Hox (2004) designed simulations with varying numbers of Level-1 and Level-2 units to test HLM techniques for bias and found that with thirty groups the estimates of standard errors were about 15% too small. In order to probe the utility of smaller samples of Level-2 units they ran a simulation with only ten clusters and found that the discrepancies between true 95% confidence interval coverage for fixed effects and estimated coverage was between 5.7% and 9.7% while a

similar comparison for the variance components was between 16.3% and 30.4% respectively. The authors used Maximum Likelihood (ML) estimates and the robust standard errors which are estimated with large sample techniques for these results. However, HLM7 software used in the current study provides estimates using Restricted Maximum Likelihood (REML) techniques and a final estimation of fixed effects which does not use robust standard errors. The difference in estimations using ML and REML are clarified in a study by McNeish and Stapleton (2016).

McNeish and Stapleton (2016), point out that much psychological research involves few Level-2 units since it can be expensive and difficult to obtain relevant samples. Most psychological studies have more variables and fewer Level-1 and Level-2 units than is mathematically ideal. They compared several HLM methods with small numbers of Level-2 units in a simulation that would approximate more realistic examples of psychological research. In particular they examined estimates of bias, coverage of confidence interval rates, and statistical power for different methods. In their matrix of samples for analysis they generated data for groups with 7 to 14 individuals and 17-34 individuals to compare groups with different numbers of Level-1 records. At Level-2 they generated clusters of 4, 8, 10, and 14 as being fairly representative of research commonly performed in psychology. The purpose of these groupings was to examine the effectiveness of HLM analysis at the lower bound of the number of units required for HLM. The result of the analysis showed that there was no bias in estimating the Level-1 residual for 14 clusters with 14-34 individuals. Regression coefficient bias for all factors averaged less than two percent with maximum of five percent for one of the factors. Since the smallest sample of students in a district in the current study is 42, this result is



an indication that estimates of variance should be acceptable. The authors say that coverage of confidence interval rates was over 95% for all of the model parameters estimated with REML for 14 clusters. Their analysis of statistical power showed that REML was on par with any of the compared methods for analyzing datasets with 14 clusters. This research leads to the conclusion that hypothesis testing using REML will adequately control for Type I error in the current study.

### **Summary of procedure**

This analysis of data followed the procedures of HLM to test variables of social capital and threat to safety on the learning outcomes of students after controlling for socio-economic status. The different stages of the analysis proceeded in a logical order in which the justification for each step was established in the preceding stages. For example, if there were no significant variance between districts based on social capital, then there could have been no mediation of the relationship between socio-economic status in districts based on social capital. The requisite conditions for testing each of the hypotheses were linked directly to the data through specific equations of the variables at two levels. Interpretation of the analysis was guided by the confirmation of the hypotheses.

## **Results**

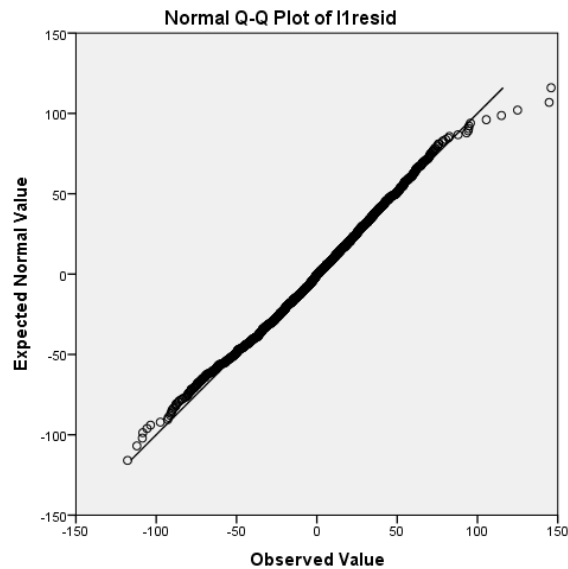
### **Testing Assumptions**

HLM is similar to regular regression, or could be considered a variation of regression. (Bickle , 2007, Bryk & Raudenbush, 1992, Tabachnick & Fidell, 2007) However, with the addition of multiple levels, the models are more complex, and since

HLM procedures are relatively recent, there is no universal agreement on testing of assumptions. Bryk and Raudenbush (1992) provide a reasonably authoritative list of assumptions to be tested. I relied on their list to guide testing of assumptions for this study. These can be paraphrased as (a) Each  $r_{ij}$ , the Level-1 residual, is independent and normally distributed. (b) The Level-1 predictors are independent of  $r_{ij}$ . (c) The random errors at Level-2 are multivariate normal (d) the Level-2 predictors are independent of the Level-2 residuals and (e) the errors at Level-1 and Level-2 are independent.

In testing the assumption a of the normal distribution of Level-1 residuals a test of homogeneity of variance can be performed in the HLM 7 software. Early in the model building it became clear that this assumption would be violated with the raw data from the 22 school districts with numbers of student records ranging from 42 to over 1500. Additionally, there were extreme outliers of students who performed extremely poorly, suggesting that perhaps they had simply refused to take the test, but their scores were counted anyway. In order to remove outliers twenty of the lowest scores that were substantially lower than the bulk of the other scores were removed from the data. Also, since large differences in group size affects calculations of homogeneity of variance, and the lowest count of students within a district was 42, I took a random sample of 100 students from each of the districts having more than 100 students in order to bring the group sizes closer for more accurate estimation. Since 100 students is still well above minimum levels necessary for HLM, the sacrifice of so many student scores did not result in a large loss of power for the analysis. It was much more important to maintain the maximum number of Level-2 units at 22, so rather than sacrifice the smallest district to use data from the larger districts; it made more sense to use fewer records from the larger

districts to maintain the highest number of Level-2 units. All of the calculations in this study reflect the dataset with 100 randomly selected students from the larger districts, even if the districts had many more actual students. With the exclusion of the twenty outliers and the use of the hundred randomly selected student scores, the test of homogeneity of variance was acceptable, indicating normal distribution of error. Bryck and Raudenbush (1992) suggest a QQ plot of Level-1 errors as a test of normality for Level-1 data. A QQ plot of Level-1 errors confirms a normal distribution of errors (figure 3).



*Figure 3* Normal QQ plot of all Level-1 residuals.

The second assumption (b) to be tested was whether the Level-1 predictor, SES centered on group mean, was independent of the Level-1 residuals. The HLM 7 software produced an SPSS file with these Level-1 values for the model. A test for correlation showed no relationship ( $r=0$ ,  $p=1$ ), so this assumption was not violated.

Assumption c, multivariate normality of the Level-2 variables was tested by a QQ plot of the MDIST (Mahalanobis distance) variable produced for the Level-2 residual file. Bryk and Raudenbush (1992) note that a QQplot of the MDIST variable on a chi-

square distribution should produce a 45 degree angle line if the variables are multivariate normal. The QQplot of the model in figure 4 below produced an approximately 45 degree line, allowing the confirmation of the assumption of multivariate normality for this model.

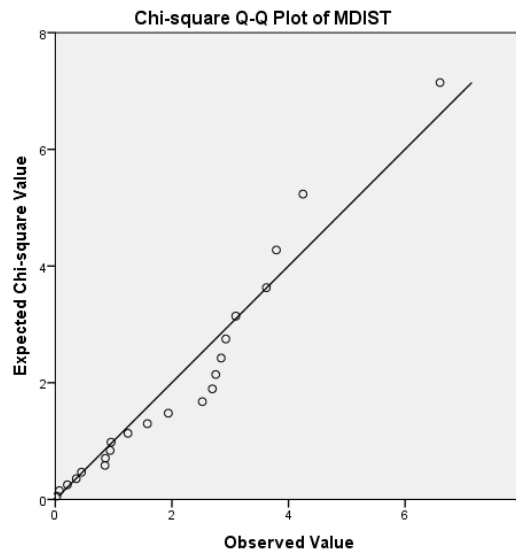


Figure 4 QQ plot of Mahalanobis distances on a chi square distribution with 2 df  
The fourth assumption (d), requires independence of Level-2 variables and errors.

The possibility of multicollinearity was considered because the two Level-2 variables were strongly correlated at  $r = -.685$ ,  $p < .001$ . Since the export file from HLM 7 includes values for the empirical Bayes residuals, and for ordinary least squares residuals for both intercept and slope, these residuals were compared individually with each of the Level-2 variables. There were no significant correlations in any of the comparisons, so this assumption was considered met. The threat of multicollinearity was that the standard errors would have been inflated, leading to difficulty in establishing significance for the variables. (Tabachnick & Fidell, 2007) For this study, significance was determined for the effect of DISCRATE on the mean of district scores and for the moderating effect of PCTGRADS on the relationship between SES and MAP scores. A way of dealing with

multicollinearity is to center the variables in question. (Tabachnick & Fidell, 2007) Since both Level-2 variables were centered on the grand mean and grand slope in the appropriate equations, multicollinearity does not threaten the validity of the results of this study.

Assumption (e) that the errors at Level-1 are independent of errors at Level-2 requires two tests: one to show that Level-1 errors are independent of errors in estimating the intercept, and a second to show that Level-1 errors are independent of errors in estimating the slope. Since there are by definition, as many Level-1 residuals as there are students, there are many more Level-1 residuals than Level-2, or district residuals. Simple one to one tests of correlation were impossible. Instead I used scatter plots of the residuals involved to determine if there were significant patterns. Figure 5 below shows a scatter plot of the empirical Bayesian error in estimating the intercept against the Level-1 residuals. Notice that since there are only twenty-two Bayesian error estimates, the Level-1 residual residuals are grouped into bars, since the students are nested in districts. If there were a relationship between these two sets of error terms the more densely packed residuals would either slope up or slope down. There is no obvious pattern in this scatter plot, so the assumption of independence of Level-1 and Level-2 errors in relation to the intercept does not seem to be violated. Figure 6 below is similar and shows no violation of the assumption of independence between Level-1 residuals and Level-2 residuals in relation to slope.

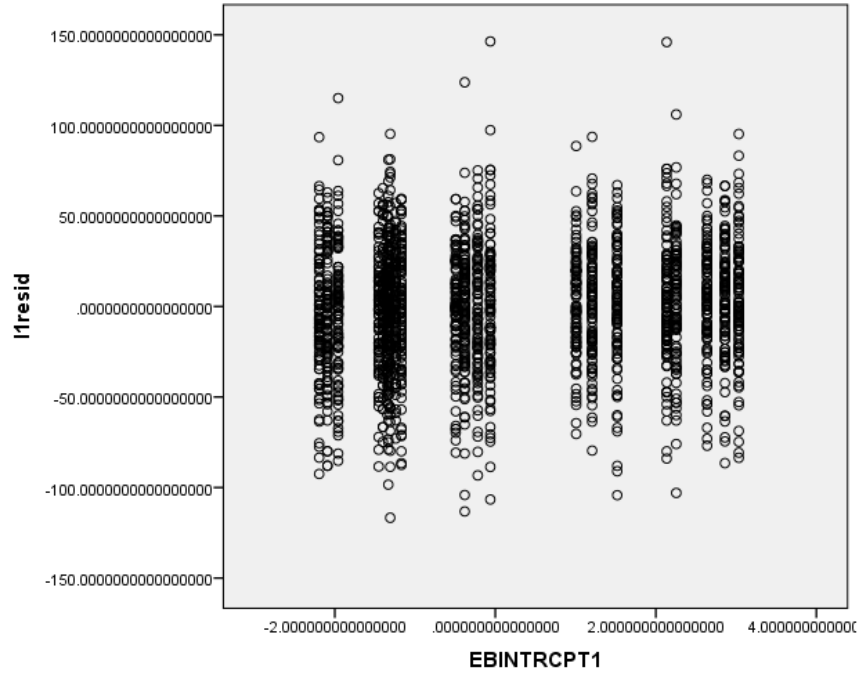


Figure 5 Scatter plot of Empirical Bayes error in relation to the intercept and Level-1 residuals.

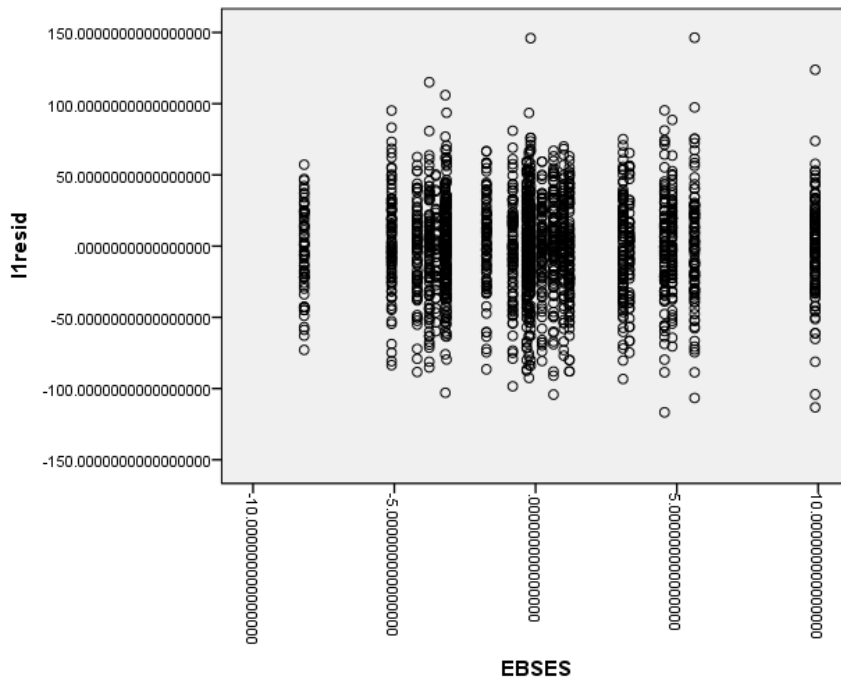


Figure 6 Scatter plot of Empirical Bayes error in relation to SES slope and Level-1 residuals.

To conclude the section on examining assumptions of HLM, the list of specific assumptions provided by Bryck and Raudenbush (1992) was specified as an authoritative set of model guidelines that should be followed. The data used for this study was determined by the steps above to have met the tests and therefore the results based on these calculations should not be threatened by violations of assumptions.

### **Model Building by Stages**

Building a well specified model required following the stages described in the procedures section above. At each stage, measures were checked to ascertain whether the data support proceeding to the next stage, adding more variables to the model, and determining whether the variables have significant impact on the outcome.

**Stage one.** The first stage of building the model was to specify the null model, that is, a model with the outcome only with no predictors using a one way analysis of variance (ANOVA). At Level-1 this means that the MAP score was the outcome, with the mean MAP score for the district plus an error term for the individual. At Level-2, the mean MAP score for the district was the dependent variable with the overall mean MAP score for all districts as the independent variable plus an error term for the individual district.

$$\text{Level-1} \quad MAP_{ij} = \beta_{0j} + r_{ij}$$

$$\text{Level-2} \quad \beta_{0j} = \gamma_{00} + U_{0j}$$

$MAP_{ij}$  is the individual MAP score

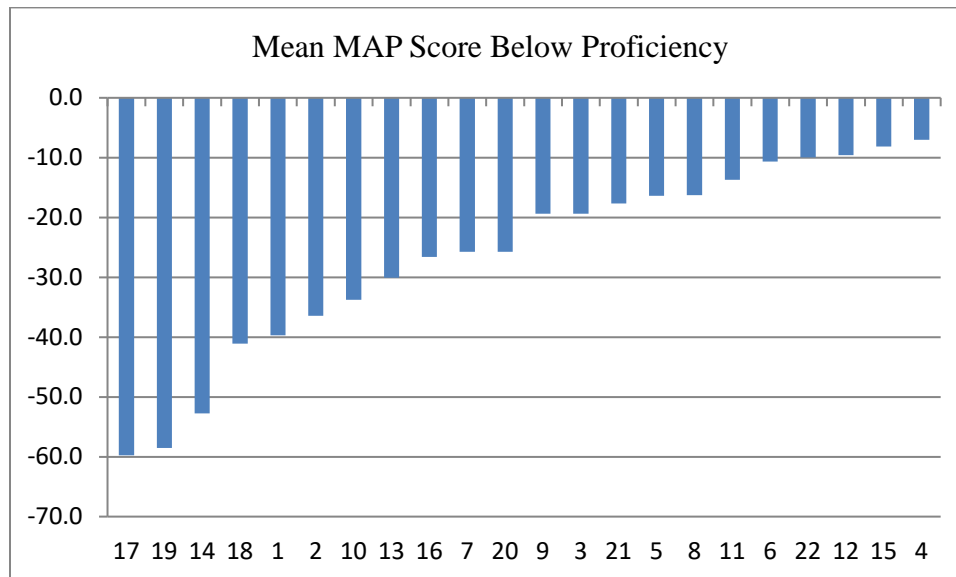
$\beta_{0j}$  is the mean MAP score for district J

$r_{ij}$  is the error in prediction for that student

$\gamma_{00}$  is the grand mean of MAP across districts

$U_{0j}$  is the error for district J

Figure 7, displays the differences in MAP score between districts. The values for MAP represent the number of raw score points on the English Language Assessments below proficiency. The chart makes clear that all of the district mean scores for special education students are below proficiency. Although special education students in some districts are fairly close to proficiency, the mean score in other districts is almost 60 points below proficiency.



*Figure 7* Mean MAP Scores of special education students below proficient by district.  
*Note* The horizontal axis refers to district numbers used in the study.

A t-test was conducted for all fixed effects, that is, second level parameters, such as  $\gamma_{00}$ , the grand mean of MAP scores, to determine if they differed significantly from zero. A chi-square test was conducted on the variance components  $U_{0j}$  which was the error term for districts in relation to the grand mean of MAP scores. Significance in the error term  $U_{0j}$  indicated that the districts differed significantly from each other in terms of



MAP outcomes. If they had not differed significantly then there would have been no point in continuing the analysis. The variance in mean MAP scores between districts was 247.88 ( $p < .001$ ) showing that there was significant difference between the districts and therefore it made sense to continue building the model to explain that difference.

Because the software also provides an estimate of the within district variance of Map scores it was possible to calculate an interclass correlation (ICC) indicating the percentage of total variance due to within and between district variance. The within group variance estimate of  $r_{ij}$  ( $\sigma^2$ ) was 1220.61 while the between group variance for  $U_{0j}$  from above was 247.88. To calculate the percent of variance due to between group variance, I divided the between group variance by the total variance, which is between group variance plus within group variance.

$$\text{ICC} = \frac{\tau_{00}}{\tau_{00} + \sigma^2} \text{ or } \text{Var}(U_{0j}) / \text{Var}(U_{0j} + \text{Var } r_{ij}) =$$

$$247.88 / (247.88 + 1220.61) = 247.88 / 1468.49 = 16.9\%$$

Therefore, 16.9% of the variance in MAP scores was due to between group variance. Put another way, 16.9% of the variance in MAP scores of students with disabilities is due to the district the students attend.

**Stage two.** In the second stage of building the model, the random coefficient regression model, I added the Level-1 predictor, socio-economic status (SES). This factor was coded to be a positive predictor in that 1 indicates a student who does not receive free or reduced lunch. This clarification is important for later interpretation. Adding a predictive variable means that each district will have a slope component which I allowed to vary randomly. That means that each district will have a calculation of the effect of SES on MAP scores that will not necessarily be the same as other districts. Calculations

based on this model allowed me to determine whether significant differences existed in the impact of SES on MAP scores at each district and if the effect of SES on MAP scores was significant overall. The equations for Level-1 and two are as follows:

$$\text{Level-1} \quad MAP_{ij} = \beta_{0j} + \beta_{1j}(SES_{ij}) + r_{ij}$$

$$\text{Level-2} \quad \beta_{0j} = \gamma_{00} + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + U_{1j}$$

The Level-1 equation is a regression equation of SES on MAP for each school in which

$MAP_{ij}$  is the individual MAP score

$\beta_{0j}$  is the mean MAP score for district J

$r_{ij}$  is the error in prediction for that student

$\gamma_{00}$  is the mean of the intercepts across districts, the grand mean

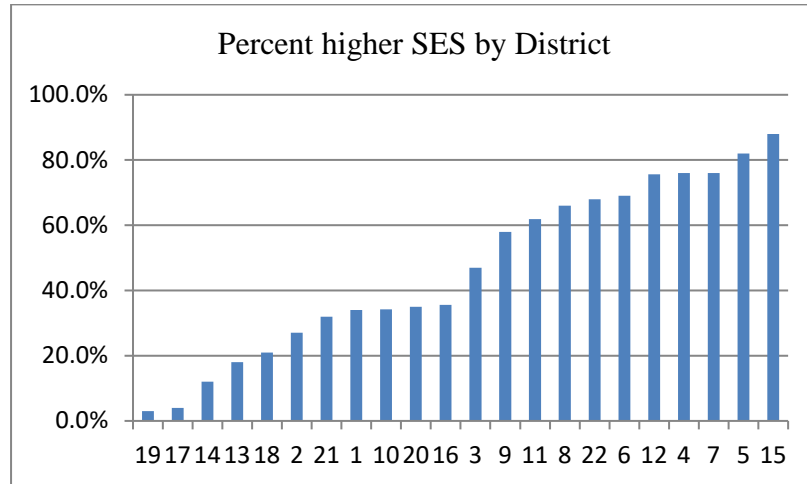
$\gamma_{10}$  is the mean of the slopes across districts, the grand slope

Variance ( $r_{ij}$ ) =  $\sigma^2$  = Level-1 residual variance

Variance ( $U_{0j}$ ) =  $\tau_{00}$  = variance in intercepts between districts

Variance ( $U_{1j}$ ) =  $\tau_{11}$  = variance in slopes between districts

In Figure 8 the means of higher socio-economic status (SES), that is, students who do not receive free or reduced lunch are charted for each district. The range of percentages is from 3% to 88% in the school districts in this study. By implication, up to 97% of students in some districts receive free or reduced lunch, while in others only 12% do.



*Figure 8* Percent of higher SES, not Free or Reduced lunch students, per school district.  
*Note* The horizontal axis refers to the identifying district number used in this study.

The final estimation for the effect of SES  $\gamma_{10}$  was 17.37 ( $p < .001$ ) which indicated that SES is significantly related to MAP scores across all districts. This statistic is direct confirmation of Hypothesis one. It should be noted, however, when looking at statistics at different stages that as more variables are added, the specific estimation of the variables may not be exactly the same since the new variable has some impact. As a general model of slope for SES, it can be interpreted to mean that on average students with disabilities who do not receive free or reduced lunch score 17 points higher on the MAP tests than students with disabilities who do receive free or reduced lunch, but this number will vary between districts. Since this factor was significant it was worthwhile to examine what factors might moderate this relationship.

Chi square tests of the variance components for intercepts ( $U_{0j}$ ) and slopes ( $U_{1j}$ ) were both significant at  $p < .001$  indicating that there was significant variance in the means of MAP scores for districts after controlling for SES (condition 2) and significant variance in the Level-1 slope of the relationship between SES and MAP scores between districts (condition 3). Therefore, since there were significant differences between

districts in MAP scores after controlling for SES and significant differences in slopes of the SES to MAP relationship, it made sense to proceed with introducing a Level-2 variable to see what was causing these differences.

**Stage three.** Stage three involves adding a Level-2 variable to the model to determine how the effects of factors at the district level affect the individual outcomes for MAP testing. The two Level-2 factors under consideration are PCTGRADS, which is the percentage of residents of the school district who have four year college degree, and DISCRATE, which is the rate of office discipline referrals per hundred students. Although in the description of the procedure in chapter 3 I assumed that PCTGRADS would be the first variable to add, Bryck and Raudenbush (1992) recommend adding variables in the order of highest impact on the outcome variable. One way to estimate the impact of Level-2 predictors is to estimate the  $R^2$  of variance explained for a model including each of the variables on their own.

In stage one, I calculated the total between group variance in the data as 247.87. By calculating the residual between group variance after taking the effect of the Level-2 variables into account it was possible to calculate the  $R^2$  of the variance that each of these variables explain using the equation:

$$\begin{aligned}
 & R^2 \text{ for level 2 intercept with Level2Var} \\
 & = \frac{(\tau_{00\text{randomRegression}} - \tau_{00\text{intercepts as outcomes}})}{\tau_{00\text{randomRegression}}} \\
 & = (\text{Var } U_{0j\text{NullModel}} - \text{Var}U_{0j\text{InterceptasOutcome}}) / \text{Var } U_{0j\text{NullModel}}
 \end{aligned}$$

In other words, by subtracting the residual variance after controlling for each of the factors from the total variance, I could determine the variance explained by each of the variables since they are responsible for the reduction in remaining variance to be explained. Building a model that includes just PCTGRADS yields a residual variance of 96.51 so the  $R^2$  calculation is

$$(247.87 - 96.51) / 247.88 = 151.36 / 247.87 = 61.0\%$$

A model that includes only DISCRATE yields a lower residual variance of 39.93 so the calculation is

$$(247.87 - 39.93) / 247.88 = 207.94 / 247.88 = 83.89\%.$$

Therefore, since DISCRATE explained more of the variance than PCTGRADS it was more appropriate to add the DISCRATE variable to the model first. It is worth noting that the percentages of variance explained were calculated alone, without including the effect that the other Level-2 factor had in the full model. Since both explain some overlapping variance, these calculations are inflated and are only used here to show that DISCRATE explained more of the variance than PCTGRADS in models with only one Level-2 predictor.

The stage three model, or intercepts as outcomes model using DISCRATE as the initial Level-2 variable is defined by the following equations.

$$\text{Level-1 } MAP_{ij} = \beta_{0j} + \beta_{1j}(SES_{ij}) + r_{ij}$$

$$\text{Level-2 } \beta_{0j} = \gamma_{00} + \gamma_{01}(DISCRATE) + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + U_{1j}$$

where:

$MAP_{ij}$  is the individual MAP score

$\beta_{0j}$  is the mean MAP score for district J

$r_{ij}$  is the error in prediction for that student

$\gamma_{00}$  is the mean intercept for all districts, grand mean

$\gamma_{01}$  is the Level-2 slope for DISCRATE

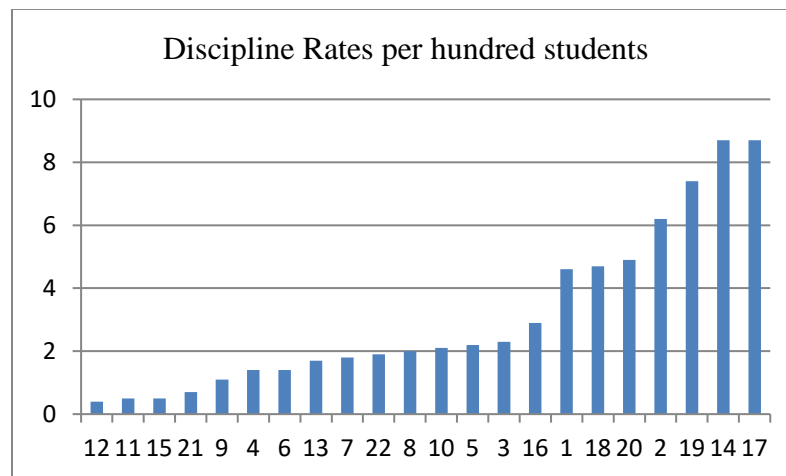
$\gamma_{10}$  is the mean slope for all districts, grand slope

Variance ( $r_{ij}$ ) =  $\sigma^2$  = Level-1 residual variance

Variance ( $U_{0j}$ ) =  $\tau_{00}$  = residual intercept variance in relation to DISCRATE

Variance ( $U_{1j}$ ) =  $\tau_{11}$  = variance in slopes between districts

In Figure 9, discipline rates per hundred students refers to the discipline incidents that were reported to the state. The discipline rates for school districts in this study ranged between .4 and 8.7 as shown in the chart below, figure 9.



*Figure 9* Discipline Rates per hundred students by District. *Note.* The horizontal axis refers to the identifying school number used in this study.

The final estimation of fixed effects yielded a coefficient of -4.162 ( $p < .001$ ) for DISCRATE in the Level-2 regression equation which indicates that DISCRATE is

negatively related to MAP scores and thus a direct test and confirmation of hypothesis six.

**Stage four.** Stage four is also known as the slopes as outcomes phase and is similar to the intercepts as outcomes phase, except that the slope of the relationship between SES and MAP for each district  $\beta_{1j}$  is the dependent variable in the regression equation. The second level predictor is added to the slopes calculation for  $\beta_{1j}$ , the slope of the district's relation of SES and MAP scores. The residuals have information about the influence of the variables on the model and the remaining variance, for example in stage three where the significance of  $U_{0j}$  revealed that a significant amount of variance remained to be explained. In stage four, the significance of the residuals gave insight into whether the Level-2 predictor moderates the Level-1 relationship between SES and MAP scores. The equation for the slopes as outcomes model is

$$\text{Level-1 } MAP_{ij} = \beta_{0j} + \beta_{1j}(SES_{ij}) + r_{ij}$$

$$\text{Level-2 } \beta_{0j} = \gamma_{00} + \gamma_{01} (DISCRATE) + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} (DISCRATE) + U_{1j}$$

where:

$MAP_{ij}$  is the individual MAP score

$\beta_{0j}$  is the mean MAP score for district J

$r_{ij}$  is the error in prediction for that student

$\gamma_{00}$  is the mean intercept for all districts, grand mean

$\gamma_{01}$  is the coefficient for DISCRATE with respect to the grand mean

$\gamma_{10}$  is the mean slope for all districts, grand slope

$\gamma_{11}$  is the coefficient for DISCRATE with respect to the grand slope

Variance ( $r_{ij}$ ) =  $\sigma^2$  = Level-1 residual variance

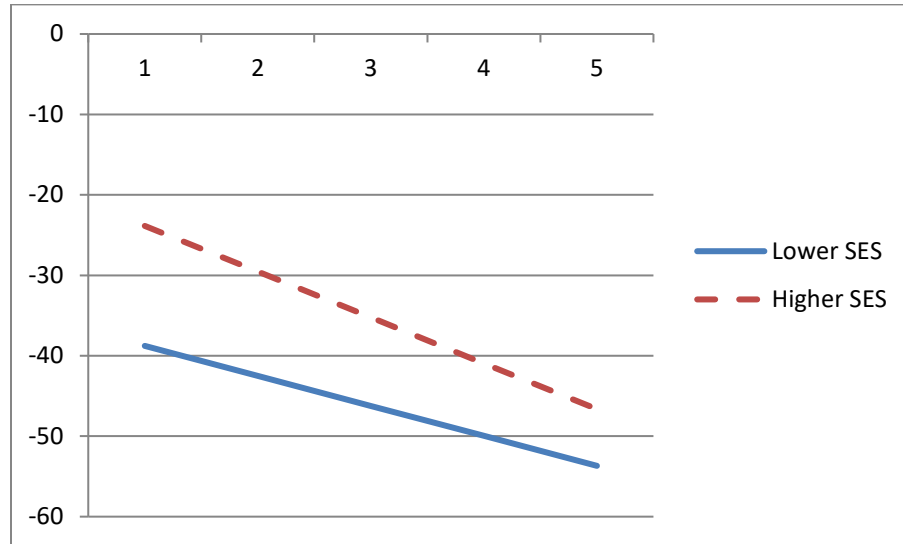
Variance ( $U_{0j}$ ) =  $\tau_{00}$  = residual intercept variance in relation to DISCRATE

Variance ( $U_{1j}$ ) =  $\tau_{11}$  = variance in slopes between districts

In stage four, the coefficient for DISCRATE in relation to SES slope, or cross level interaction with SES (DISCRATE\*SES), was significant at -2.196(p = .012). The significance of the coefficient of a Level-2 factor is a direct test of hypotheses regarding the moderation of the slope of impact of SES on MAP. Calculation of the significance of DISCRATE\*SES in stage three indicated that DISCRATE did indeed moderate the slope of SES on MAP. However, as will be seen below, in the final model with the second Level-2 variable PCTGRADS included, the contribution of DISCRATE to the slope was no longer significant.

Figure 10 shows the regression lines of the final fitted values for individual MAP scores for Higher SES students, and Lower SES students, that is, students receiving free or reduced lunch. The downward slope of the lines reflects the negative influence of discipline rates on MAP scores, while the fact that the line for higher SES students is above the lower SES line means that their scores were overall higher.





*Figure 10* Regression lines for test scores of Higher and Lower SES students in relation to discipline rates

**Stage five.** In stage five the PCTGRADS district level variable was added to a “means as outcomes” regression calculation which determined whether the percentage of graduates significantly affected the mean district MAP scores of IEP students. Figure 11 shows the differences in percent of college graduates in a school district. The percentages of graduates in a district range from 5.5% to 35.1% or roughly from one out of twenty people in the district to one out of three people in the district having college degrees.

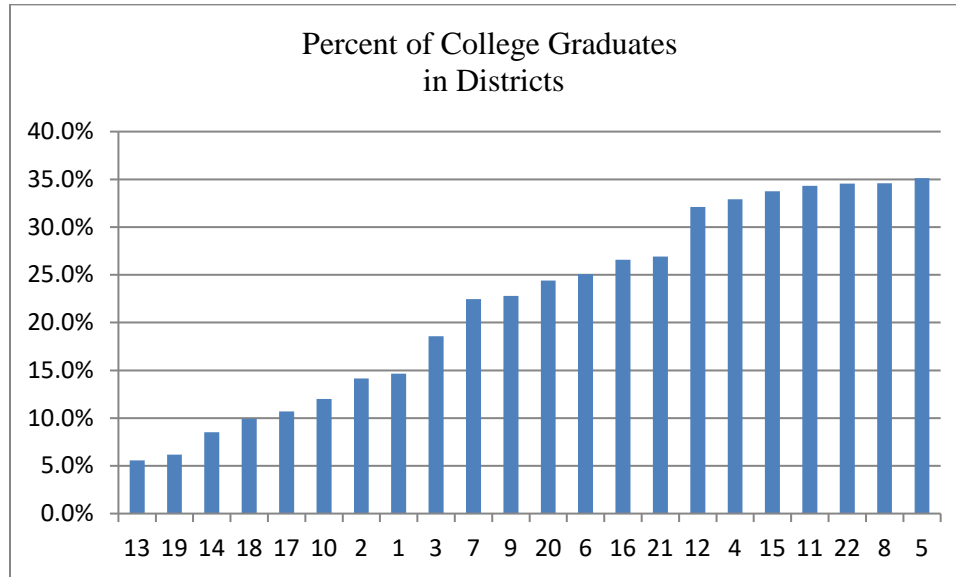


Figure 11 Percent of district population with four year college degrees by district number. The horizontal axis contains the district numbers used in this study.

The equations for the means as outcomes model with the addition of PCTGRADS

is:

$$\text{Level-1 } MAP_{ij} = \beta_{0j} + \beta_{1j}(SES_{ij}) + r_{ij}$$

$$\text{Level-2 } \beta_{0j} = \gamma_{00} + \gamma_{01} (DISCRATE) + \gamma_{02} (PCTGRADS) + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} (DISCRATE) + U_{1j}$$

where:

$MAP_{ij}$  is the individual MAP score

$\beta_{0j}$  is the mean MAP score for district J

$r_{ij}$  is the error in prediction for that student

$\gamma_{00}$  is the mean intercept for all districts, grand mean

$\gamma_{01}$  is the coefficient for DISCRATE with respect to the grand mean

$\gamma_{02}$  is the coefficient for PCTGRADS with respect to the grand mean

$\gamma_{10}$  is the mean slope for all districts, grand slope

$\gamma_{11}$  is the coefficient for DISCRATE with respect to the grand slope

Variance ( $r_{ij}$ ) =  $\sigma^2$  = Level-1 residual variance

Variance ( $U_{0j}$ ) =  $\tau_{00}$  = residual intercept variance after accounting for DISCRATE and PCTGRADS

Variance ( $U_{1j}$ ) =  $\tau_{11}$  = variance in slopes between districts

Interpretation of stage five is similar to the interpretation of the means as outcomes analysis in stage three. The key statistics are the significance of the coefficients of the Level-2 variables,  $\gamma_{01}$  and  $\gamma_{02}$ . Although the significance of the coefficient of DISCRATE has already been tested, the addition of another variable to explain the same pool of variance makes possible a change in significance. In this case, however, the coefficients for DISCRATE was -2.256 (p = .01) meaning that it contributed significantly to differences in mean district MAP scores for students with IEPs. The significance of this statistic meets condition six for hypothesis testing listed in chapter 3.

**Stage six.** Stage six is the final stage of analysis in which the final model is complete. In this stage PCTGRADS was added to the calculation of slopes as outcomes to determine its effect on the slope, or relationship between SES and MAP score. The formula for stage six is:

$$\text{Level-1 } MAP_{ij} = \beta_{0j} + \beta_{1j}(SES_{ij}) + r_{ij}$$

$$\text{Level-2 } \beta_{0j} = \gamma_{00} + \gamma_{01} (DISCRATE) + \gamma_{02} (PCTGRADS) + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} (DISCRATE) + \gamma_{12} (PCTGRADS) + U_{1j}$$

where:

$MAP_{ij}$  is the individual MAP score

$\beta_{0j}$  is the mean MAP score for district J

$r_{ij}$  is the error in prediction for that student

$\gamma_{00}$  is the mean intercept for all districts, grand mean

$\gamma_{01}$  is the coefficient for DISCRATE with respect to the grand mean

$\gamma_{02}$  is the coefficient for PCTGRADS with respect to the grand mean

$\gamma_{10}$  is the mean slope for all districts, grand slope

$\gamma_{11}$  is the coefficient for DISCRATE with respect to the grand slope

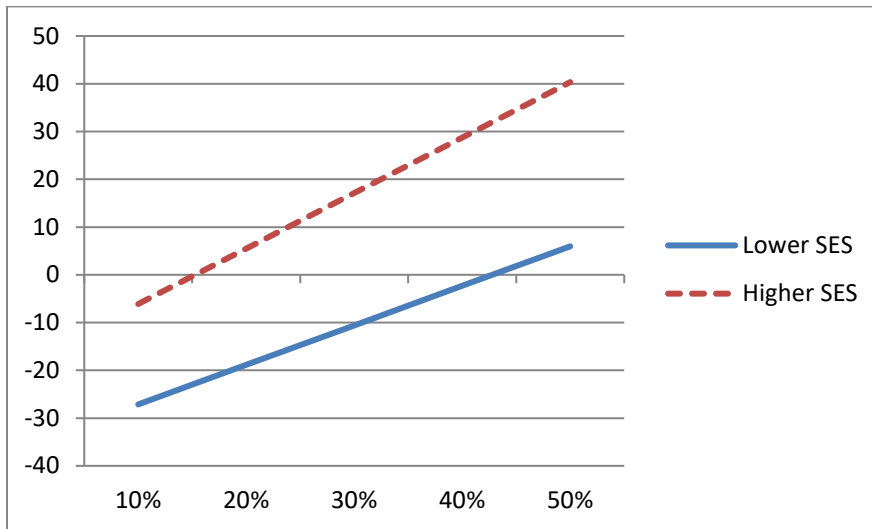
$\gamma_{12}$  is the coefficient for PCTGRADS with respect to the grand slope

Variance ( $r_{ij}$ ) =  $\sigma^2$  = Level-1 residual variance

Variance ( $U_{0j}$ ) =  $\tau_{00}$  = residual intercept variance in relation to DISCRATE and PCTGRADS

Variance ( $U_{1j}$ ) =  $\tau_{11}$  = residual variance in slopes between districts in relation to DISCRATE and PCTGRADS

Figure 12 shows the regression lines of the final fitted value of MAP scores as predicted by the percent of college graduates in a district for higher SES students and for lower SES students. The line for the higher SES students is steeper, indicating that there was more effect of the predictor, percent of college graduates, for the higher SES students than for students of lower SES. The difference in slope between the two lines was significant, meaning that the percent of college graduates in a district significantly moderated the relationship between SES and MAP scores.



*Figure 12* Regression of PCTGRADS on MAP scores for higher and for lower SES students.

The key statistics in stage six were the significance statistics of the coefficients and error terms of the Level-2 variables. There is an interesting development in stage six in that although in stage four, the coefficient of DISCRATE\*SES was significant, indicating that it had a significant moderating effect on the relationship between SES and MAP scores, the addition of PCTGRADS\*SES removed that significance. Since as we will see in the discussion below, DISCRATE and PCTGRADS are correlated, it seems that DISCRATE appeared to be a moderator when PCTGRADS was not included in the equation, but when PCTGRADS\*SES was taken into account, the effect of DISCRATE became insignificant. In stage six the coefficient of DISCRATE\*SES in relation to slope ( $\gamma_{11}$ ) was insignificant at  $p = .754$ . This result disconfirms condition seven above and therefore does not allow the affirmation of the hypothesis that discipline rate moderates the relationship between SES and MAP scores.

The coefficient of PCTGRADS was 8.538 ( $p = .722$ ) so in the final model the percent of graduates in a community did not significantly affect the mean MAP scores of

the district. However, the significance of the coefficient for PCTGRADS\*SES at  $p < .05$  means that PCTGRADS significantly affected and therefore moderated the relationship between SES and MAP scores. This result confirms condition five above and is a confirmation of the broadly stated hypothesis that percentage of college graduates will moderate the effect of SES on MAP scores. However, in the discussion of the hypothesis above, it was assumed that the moderation would be negative in the sense that the higher percentage of college graduates, and therefore, of social capital, the relationship between SES and MAP scores would be lessened, that is, that the gap between those who receive free and reduced lunch would close the gap with their peers. The positive sign on the coefficient means that instead of lessening, the concentration of college graduates increases this gap. In all districts, wealthier students scored higher than poorer students on average, but in districts with higher percentages of college graduates the disparity associated with differences in wealth was even greater.

### **Summary**

Specific statistics from the model were used to allow, or disallow, the confirmation of the hypotheses. In this section I will review the testing of the hypotheses that have guided this inquiry. Although the testing was discussed in the stages above, the presentation of data was ordered by the steps in the model building. This section will attempt to clarify how the data related to the hypotheses in a more straightforward manner.

**Hypothesis one.** Hypothesis one predicted that socio-economic status (SES) would be significantly related to MAP scale score. This hypothesis was confirmed through statistics gathered in stages one and two. In stage one the null model, with no

predictors, only MAP score was examined. The term for the residual error for the districts in relation to the mean,  $U_{0j}$ , was significant at  $p < .001$  meaning that there was significant variance between districts in terms of MAP scores. Since there was significant difference between districts, the next step in stage 2 was to add the Level-1 variable SES to determine the effect of SES within districts on MAP scores. With SES as a predictor, the calculation was similar to linear regression so the important statistic is the coefficient of SES and its significance. The coefficient of the grand slope of SES,  $\gamma_{10} = 15.89$  ( $p < .001$ ). Since the coefficient of SES is significant across all districts I can confirm Hypothesis one, that SES is significantly related to MAP scores.

**Hypothesis two.** Hypothesis two predicted that percent of college graduates would be positively related to MAP scale score after controlling for SES. Although the initial plan was to include percent college (PCTGRADS) in the earlier stages, as mentioned above, DISCRATE had more effect, so DISCRATE was added to the model first. For that reason the statistics for hypothesis 2 were calculated in the later stages rather than the earlier stages. SES was controlled for by adding it as a factor in level one to explain within district variance. PCTGRADS was added in stage five as a factor affecting the mean MAP score of districts. In the final model, the coefficient of PCTGRADS was not significant at  $\gamma_{01} = 8.53$  ( $p < .001$ ). The lack of significance of this statistic does not allow confirmation that PCTGRADS is significantly related to MAP scores.

**Hypothesis three.** Hypothesis three predicted that the percent of college graduates in a district would moderate the SES to MAP relationship. In other words, the percent of college graduates in a district will affect the impact of SES on MAP scores.

PCTGRADS was added as a variable affecting the slope or relationship between SES and MAP in stage six. The coefficient  $\gamma_{11}$  was significant at 66.88 ( $p = 0.04$ ) so PCTGRADS does indeed moderate the effect of SES on MAP scores. However, since the value of  $\gamma_{11} = 66.88$  is positive, the assumption that the moderation would decrease the gap between students who received free or reduced lunch and those who are from more privileged families is not supported. In fact, the concentration of graduates in a district increases the gap in achievement based on SES. For Hypothesis three, which is in reality two separate hypotheses, I can confirm that the percent of college graduates in a district moderates the relationship between SES and MAP scores. However, I cannot confirm that the percent of college graduates lessens the impact of SES, but rather increases the impact.

**Hypothesis four.** Hypothesis four predicted that discipline rate would be negatively related to MAP after controlling for SES. In other words, students in districts with higher incident rates would score lower on MAP after controlling for SES. Discipline rate was added to the model in stage three as a factor affecting the district mean of MAP scores. The coefficient of DISCRATE in the final model was  $\gamma_{01} = -3.24$  ( $p = .002$ ). Since the statistic is significant I can confirm that DISCRATE significantly affects MAP scores and since the coefficient is negative I can confirm that this impact is negative. In other words, special education students in districts with higher discipline rates tend to have lower MAP scores.

**Hypothesis five.** Hypothesis five predicted that discipline rate would moderate the SES to MAP relationship. In other words, in districts with a higher discipline rates, the impact of SES on MAP will be more. The coefficient of DISCRATE in the final



model was negative at  $\gamma_{11} = -.294$  ( $p = .811$ ). This statistic was not significant, so I cannot confirm the hypothesis that discipline rate moderates the impact of SES on MAP scores.

### **Assessing the Model**

Bryk and Raudenbush (1992) and Tabachnick and Fidell (2007) recommend a process to determine if the model is significantly more accurate in predicting the outcomes than random factors. HLM 7 produces a deviance statistic that is a measure of model fit. The lower the deviance statistic, the better it fits the data. By subtracting the deviance of one model from the original and subtracting the difference in degrees of freedom between the models, one can determine if the final model is a significant improvement over the null model, or randomness. In this case the deviance statistic for the final model was 20330.3 (4), compared to the original null model statistic of 20505.2 (2). The calculation for the difference was  $20505.22 - 20330.3 = 174.9$  (2) The chi square test of significance for the 174.9 in deviance with two degrees of freedom is significant at  $p < .001$ . This result allows the confirmation that the model is statistically significant in explaining the outcome, MAP scores for students with disabilities.

These results will be discussed with implications for research and policy in the following section.

## **Discussion**

The importance of the impact of socio-economic status on learning was an underlying motivation for this study and guided the research questions which were posed to illuminate the mechanisms by which poverty suppresses learning. For this study, the

relationship of socio-economic status and MAP scores was important primarily because it allowed the examination of district or community level factors that might moderate that relationship. One of the hypotheses of this study was that socio-economic status significantly affects learning. Many researchers have discussed the effect of socio-economic status on learning, so the finding that socio-economic status was a significant predictor of learning as measured by MAP scores confirms a pattern already noted in the literature. (Berliner, 2014; Krashen, 2010; Skiba et al., 2005) With the relationship between SES and MAP scores established at the individual level, the community level factors were interesting as possible factors that could also affect learning directly, or could moderate the impact of wealth and poverty on learning.

I hypothesized that social capital, as measured by percent of college graduates in a district, would significantly affect MAP scores, but this significance was not confirmed in this study. This finding is in contrast to the literature about the general community benefits of education (Watts, 2001), the benefits of social capital in a community for education (Jorgenson et al., 2014), and the benefits of social capital for students with disabilities (Trainer et al., 2013, Whitney et al., 2012, Wilkins & Hehir, 2008). Some of the strongest explanations for the impact of social capital on learning follow from the idea that a higher concentration of college graduates in a community would have beneficial effects on learning through advocacy for special education students shared parental knowledge and high expectations. However, these benefits were not revealed in the results of this study. Students with disabilities did not benefit from a higher percentage of college e graduates in a community. The results of this study call into question the communal benefits of education for students with disabilities.

This model takes several relationships into account including the effect of threats to safety and moderation of SES by the Level-2 factors. In the complete, final model the effect of the percent of college graduates was not significant, meaning that when other factors such as discipline rates are controlled for, the effect of percent of college graduates was not significant. Discipline rate explained some of the variance in the mean MAP score that might otherwise have been attributed to percent of college graduates.

Another possible factor that might explain this lack of difference is the effect of the single provider of special education services for all of the students in the study. It could be that the unified system for providing services smoothed out differences that would have been expected based on differing amounts of social capital. Research into the role of special educators could shed light on this speculation.

Finally, from a theoretical perspective, it could be that Maslow was right, the threat to safety outweighs other needs and affects the mean score of students in a district more than the concentration of college graduates in the community.

That hypothesis, that that discipline rate would be negatively related to MAP scores for students with disabilities, was confirmed. Again, maybe Maslow was right. Threats to safety may be at the root of differences between school districts. The threat of bullying could be a possible explanation for the reduction in learning as Maslow (1942, 1943a, 1943b) reasoned that individuals will be consumed with meeting basic safety needs before being able to turn attention to other needs. Bullying could also have affected students with disabilities disproportionately as discussed in the literature (Carney et al., 2011, Gorman-Smith, 2012) Students with disabilities are bullied more often than students without disabilities, and this bullying may affect their academic performance

disproportionately. Research that includes all students in a school rather than just students with disabilities could provide clarity on this question.

From a policy perspective, this finding suggests that efforts to improve school climate and reduce the need for office referrals would have a positive effect on learning for students with disabilities. Prosocial programs such as character education and positive behavior intervention and supports (PBIS) designed to address problem behavior such as bullying are supported in the findings of this study (Brennan, Turnbull & Turnbull, 2000; Parker, Nelson & Burns, 2010)

I found in this study a high negative correlation of discipline rate and percent of college graduates in a community at  $r = -0.684$  ( $p < .01$ ) meaning that discipline rates go down in districts with higher concentrations of college graduates. It may be that the conditions which lead to higher rates of discipline drive away families with higher education. The results of this study suggest that policies that punish school districts for lower aggregate MAP scores without taking community factors into account are ill informed.

A second set of hypotheses examined the possibility that community factors could moderate the impact of poverty on learning. One predicted that percent of college graduates would moderate the relationship between SES and MAP scores. The assumption was that the moderation would be in a negative direction, that is, that greater percent of college graduates would lead to lessening of the achievement gap between higher and lower SES students. Although the percent of college graduates did significantly moderate the relationship between socio-economic status and MAP scores, the moderation was not negative, but positive. In districts with higher concentrations of

college graduates, the gap between MAP scores for free lunch students and their peers is not smaller; it is greater. This result was the most surprising, revealing my mistaken assumption that percent of higher education graduates in a district would lessen the achievement gap between higher and lower SES students. As I will discuss, however, Bourdieu himself would not have been surprised. The underlying assumption that was disproven was that community education was a panacea that would cure all social ills, such as disproportionality in achievement.

Not only do students with disabilities not perform better in districts with higher percentages of college graduates, but also the gap between the socio-economic groups is larger in these districts. The impact of poverty is higher. As mentioned, for Bourdieu (1992) this relationship would not necessarily be a surprise. A critical aspect of social, cultural, and economic capital for him is symbolic violence, or competition between individuals and groups. For the current study, it seems that social capital is poorly shared within the school districts, and the children of the families with the most social capital benefit the most. College educated families may share social capital among themselves more than with others. It is not hard to imagine that highly educated families form more open social bonds with other highly educated families in social groups than they do with lower SES students and that these parents spend considerable time and expense to help prepare their children for the educational system.

Bourdieu might point out that the habitus of college educated families assumes that education is the important game. If the parents have gone through the process of gaining admission to college, spending years in acquiring educational credentials and paying or financing college, they demonstrate that they value education as a path not only

to other social goods, but as an end in itself. They teach their children to concentrate on, and win at education.

Concentrations of college graduates in a district did not give everyone an advantage in this study, but the children of well connected, well educated families did get an advantage. This logic assumes that children of the college educated tend to not receive free lunch, a statement that is probably broadly true because of the financial requirements to get a college degree and the economic benefits of having a college degree. For Bourdieu, economic capital, cultural capital, and social capital are all forms of the same competitive phenomenon. Individuals and families use their capital in all its forms to their own advantage. In the sample for this study, this limiting view of how social capital is exercised and distributed within community seemed to be correct. Greater concentration of educated families did not reduce class differences related to learning for special education students, but rather it increased the gap. The results of this study suggest that it is not enough to simply put students from different socio-economic backgrounds in the same classroom and be satisfied that they have the same possibility of success. Rather it is important to consider the continuing reach of the effects of poverty into the classroom. It may well be that children who receive free lunch in a district with high levels of education may suffer from a self defeating stigma of social class more than in other districts. Another possibility is that teachers in districts with higher percentages of college degrees may make assumptions about the educational background of their students. College educated families may develop reading, vocabulary and math skills in the home. The teachers may therefore rush through essential basic curriculum in order to concentrate on the higher, more advanced aspects of curriculum to satisfy parents who

want to see the needs of their children met. More research is needed to determine whether this pattern is replicated elsewhere.

The other hypothesis regarding moderation of the effect of poverty on learning, that discipline rate moderates the relationship of socio-economic status to MAP scores was not supported in this study. In other words, in districts with higher discipline rates, the impact of SES on MAP is not significantly higher than in districts with lower discipline rates. The analysis indicates that although scores are higher overall in districts with lower discipline rates, discipline rate does not affect students receiving free lunch any differently from their peers. This finding may mean that bullying, for example, is prevalent and harmful regardless of social class, and that the disruptions that lead to referrals affect students with disabilities across all socio-economic groups regardless of family wealth.

In my initial design I had imagined that social capital would be a more important factor in the model than discipline rate; but the analysis showed that the discipline rate had a significant impact on the mean MAP scores, whereas social capital, as measured by the percent of college graduates in a district, did not. There are at least two possible explanations for this finding: a theoretical explanation and a more practical explanation.

The theoretical explanation would reason that of the two variables in question, social capital and environmental threat to safety, it is environmental threat that has the greatest impact on the learning of students with disabilities. For this population it seems that the conditions leading to discipline referrals are more important than the effects of social capital. It may be that the effects of Maslow's (1942) theories of threat and of a hierarchy of needs have more influence than the effects of Bourdieu's social capital.

A more practical explanation involves the selection of the measures for this study, , in particular, how well did the selected variables operationalize the theoretical constructs of social capital and threat to safety, and how sensitive to variations in the constructs were they? The measure for social capital was the percent of college graduates in school districts; as such it measured phenomena that are far from the classroom. On the other hand, the rate of discipline referrals is closely tied to the classroom. Bullying or other threatening behaviors are present on a daily basis. The predictive capacity of rate of referrals may benefit from this relative closeness of threatening behavior to the learning environment of the students. Given that the two district variables are highly correlated ( $r = -0.684$ ;  $p < .01$ ), further research with more or different measures could help clarify the relationship between the effects of social capital and threats to safety.

### **Limitations of the Study**

The choice of literacy MAP scores as a measure of student learning for this study may limit the generalizability of this study. Some students undoubtedly do better at math than at verbal tasks, and at first glance, a total score might seem to more accurately reflect achievement. However, because language is a gateway to other subjects, it is a basic ability that can probably reflect achievement more reliably than other abilities. Math scores tend to vary more across measurements, and it was thought that the literacy score would reflect less variation than the total score and therefore be more consistent in terms of measurement of a dependent variable.

The broad pattern of variation in MAP scores is not new information for educators or those responsible for educational policy. Often the explanation for the differences in student achievement is discussed in terms of relative wealth and race. One



of the limitations of this study is that the community variables, percent of college graduates and discipline rate, may also be correlated with median income and race in a community. The study is therefore vulnerable to criticism that it is not covering any new ground and is even methodologically suspect because of correlations to these other factors. However, the choice to use these factors was made purposively, resting on solid theoretical grounding for social capital (Bourdieu, 1992) and threats to safety (Maslow, 1942). This study is an attempt to get beyond arguments about median income and race to some of the mechanisms at work that produce disparities of achievement between communities.

The number of Level-2 units, or school districts, is another limitation of this study. Although tests of reliability and significance indicate that there were enough units to draw valid conclusions, more would have been better. The community of mathematicians working with HLM is divided on how many level two units are enough for valid analysis. Some, such as Maas and Hox (2004), argue for a higher number of units for better certainty, while others in the research community such as McNeish and Stapleton (2016) argue that the methods are powerful enough for use in social science research which often does not function in ideal mathematical conditions. A larger study, with greater power as a function of more Level-2 units, might be able to discriminate between the forces of economic capital separately from social capital.

Another possible limitation is that the study made an assumption that the conditions prompting discipline referrals are fairly standard across school districts. Since discipline referrals were meant to measure school safety, bullying, and stability, it was fairly important that they be reported without bias between districts. The actual number

of referrals reported to the state department of education can be quite small, so differences in school district culture on what to report could have affected conclusions based on this measure.

### **Recommendations for Future Research**

Although this study used discipline rates as a predictor to help explain differences in student learning, it did not examine patterns of variance in the proportion of referrals issued for students with disabilities. Districts that issue relatively higher numbers of referrals to students with disabilities, particularly for behaviors related to disability, may in fact become part of a threatening environment. The ratios of suspensions for special education students in relation to their peers are reported every year for each district. This ratio could be used as a measure of environmental threat for students with disabilities in data models built in future research. As much as we don't like to think of school itself, and educators, as threats, it is likely that for some students at least, teachers and school staff are perceived as threats.

Another possibility for further study would be to include all of the students in school districts rather than just students with disabilities. Although this study focused on the particular case of students with disabilities, many of the forces discussed could apply, and theoretically would apply, to all students. Future research could build a model including all students with a categorical variable identifying students with disabilities to examine the extent to which the trends identified in this study applied to all students and the extent to which they applied to a greater or lesser extent to students with disabilities.

**Concluding remarks**

This analysis reveals an educational system that is distorted by the effects of poverty, levels of education, and threats to safety. Concentration of college graduates do not lead to equality of learning. It may be that increasing the number of college graduates will increase the gap between rich and poor, between college educated and everyone else.

The impact of family social capital is stronger in school districts with higher levels of education while environments with higher levels of problematic behavior impose a negative effect on wealthy and poor alike. These currents affect students with disabilities and provide the best environments for students who are not poor and go to school in a district with few behavior issues. Conversely, a student who is poor will find a more difficult time even in highly educated districts. All students suffer the consequences of districts with chaotic behavioral environments. According to the findings of this study problem behavior and threats to safety in schools have immense impact on learning, and account for a significant amount of the differences in achievement between school districts.

This study was motivated by questions about how community factors affected the learning of students with disabilities, and how those factors affected the relationship between poverty and learning. Building primarily on the theoretical insights of Bourdieu (1992) and Maslow (1942) a model was proposed with variables for social capital, operationalized as percent of college graduates, and threats to safety, as measured by office referrals per hundred students. An implicit question that led to the use of HLM to build the model was whether the impact of these factors varied across different school districts. The results of this study indicate that these factors do impact the learning of

students with disabilities, so the success of the students, their families, and their teachers in achieving learning goals is affected to some extent by the social capital and discipline rate in their school community. For educators and policy makers concerned with the education of students with disabilities who live in poverty, the impact of social capital and of threats to safety should be considered as factors in shaping effective policy.

From a policy perspective it is clear that family levels of education have a large impact on inequality of achievement among students with disabilities. Safe and effective public education for all students is essential for overcoming disparity between communities both as a resource for parents and for their children. Similarly, although concentrations of college graduates can increase disparities within districts, greater access to college education would help more families overcome the effects of poverty.

Education is good for those who have it and their children.

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