

Poverty, race, and achievement in  
science classes

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### **Abstract:**

This paper is about the relationship between achievement in science classes (especially chemistry), and race, mainly among the black race (African-American) as a minority. The study is a trial to cover only the affect of poverty, among black students in high school, and their ability to achieve in science classes.

The literature reviewed in this paper aims to find the relationship between poverty and poor achievement, starting with inadequate nutrient in early childhood, and ending with lowered expectations of minority students. Many factors behind the problem go back to the root of racism in the country, and the attitude in the United States towards poverty.

The research is covering only one College Preparatory Chemistry class, in Brandywine High School, Wilmington, Delaware, where many students come from an urban setting, which is classified as a low-income, high crime rate area.

## **Introduction**

Choosing such a topic wasn't an easy decision to make, due to the sensitivity of the issues, and the difficulty of collecting the needed information. Another factor that may affect this study is the number of students the paper is covering. Only one chemistry class is a College Prep level. I chose this class because the number of black students is almost a third of the total number of the students (eight black students, and seventeen white students).

I admit it was not easy at all to find a direct relationship between low-income families and their children's achievement in the science classroom, but most of them either covered younger students (elementary school), or focused only on female students in science classes, while another studies covered minor females achievement in science and math classes.

Another factor that made my task harder is the sensitivity of the topic itself. When it comes to income and race many voices speak up, and many thoughts debate about the purpose of the research; even finding information from my students was not an easy task. A survey was designed to collect some information from the students in this class; a ten-question survey mainly covered total household income, race, gender, and place of birth.

I believe the timing of this survey, which was given to my students at the end of the third marking period, was a good decision because by this time of the year, I have spent enough time to know my students, and their ability to achieve in my chemistry class. Also, I have enough of their grades and test scores, to use them to support my study. On the other hand, through the school year I had a chance to meet with some parents during the school's Open House, parent conferences, and school activities. Some of these parents are in touch with me either via e-mail, or phone, while others, never try to call even though their children are achieving poorly in my classroom.

A primary contribution to my work is the direct relationship between my students, and me as a teacher especially when they stay after school for extra help, or to do some work for extra credit. This kind of teacher-student relation helped me to find out if they have a computer at home, how many siblings they have, or when they ask for a bus pass. These kinds of particular types of information contribute to this study, by giving me insight about my students' environment, where they are from, and their living conditions.

## **Literature Review**

Researches show that parents rated the importance of helping their child with academic work very high. Parents of second graders tended to rate the importance of helping higher than did parents of third graders. Similar to past research, ratings varied systematically as a function of parents' perceptions of children's academic performance and as a function of whether teachers had offered suggestions; however, parents perceived helping with reading as more important than helping with math. Findings implied that teachers who desire more parent involvement might need to use different strategies for the two subjects. In addition to specific approaches for helping with math, reading, and homework, parents noted other activities they believed would help their children succeed. "Low-income parents' beliefs about their role in children's academic learning" (Univ. of Chicago Press journal articles; reports-evaluative Jan 2004)

Even though this journal doesn't talk directly about high school students, it shows how low-income families would help their children up to a certain level, and in a certain subject area, and that likely they prefer to help more with reading than math. I believe at the high school level we face a bigger challenge where it's harder for either middle educated or non-educated parents to keep up with their children or push them to take advanced classes especially in math and science.

In my Honors Chemistry class I have only one black student among twenty-six white students, and in Honor Chemistry Lab class I have two black students among twenty-six students.

Most the time parents call me concerning their children's progress. They are trying hard to help their children, and they either ask a family member, or a neighbor to spend some time with their children. They can't afford to pay a tutor, but they do their best to find help from a semi-professional.

On the other hand, some low-income parents don't care at all; even if we call them they either don't care, or they have lost control over their children. Also, it could be they don't value the importance of science in their children's lives.

Another interesting study about the relationship between race, poverty, and teacher mobility was conducted in Georgia. Simple descriptive statistics indicate, "New teachers are more likely to leave schools with lower test scores, lower income, or higher proportions of minorities" (Scafidi, Sjoquist, & Steinbrickner 2007: p.15).

Recent studies indicates that wages are the characteristics that have been most often studied in the past, and was classified as the main reason for teachers to leave their teaching job. This study suggest that teachers who serve higher proportions of minority students are more likely to leave their first teaching job either by moving to new schools within their districts, moving to a completely new district, or seeking a teaching job out of the public system, where private schools have the choice to pick their students, as they

have the choice to reject the admission of any low-achievement student (Race, poverty, and teacher mobility” Scafidi, Benjamin; sjoquist, David L.; Stinebrickenr, Todd R. Apr 2007).

Though the study did not show the relationship between low-income students, and their achievement in science classes, it pointed to another factor that may affect minority students in school, which is not only the quality of science teachers, but also the ability of these teachers to teach minority students, and their expectations from these students. According to this study, many teachers leave their teaching job in the first years of teaching, to other high-income areas, or avoid schools that serve minority students.

As a result of low-expectations from minority students, or working in such unacceptable environments to these teachers, the outcome of the educational process will show poor classroom achievement.

In the third journal about confronting the achievement gap, David Gardner who is one of the most important literature reviewers made a study. “The difference in achievement levels will surprise no one: high in the affluent, white school; much lower in schools where poverty is common. The question is, Why is this so?” (Gardner 2007: p.5)

Gardner in his study about the large achievement gap between children of color, and their white peers, touched based on some important reasons. First, Gardner points to many minority students who are coming from a background of poverty, where receiving inadequate nourishment at a time when bodies and brains are rapidly developing has

effected them. “Proper human development requires a steady and healthy diet, and poor children are rarely get such a diet”(Gardner 2007: p.5).

Another factor would affect the growth of minority students who live in poverty is lacking of self-esteem. Gardner sees poor children have fewer opportunities for enriching experiences. Poor people don't take trips to Europe or Africa; in most cases they don't even leave their neighborhoods. For a poor child a trip to a zoo is a dream, or being in art museum or library. As Gardner indicates here, the poor children still have their own experiences but it's totally different from the rich children experiences. Gardner believes anger is the response from poor children when the greater society doesn't value their culture (Gardner 2007: p. 5)

On the other hand, Gardner talks about locus of control; “People with an internal locus of control see themselves as primarily responsible for their successes and failures. People with an external locus of control tend to attribute their successes and failures to outside factors: luck, fate, the boss likes me, the teacher doesn't like me, etc”(Gardner 2007: p.5).

Finally the long-term effects of racism on the achievement gap should not be underestimated. Gardner sees an essential need to change the attitudes in the United States. Eliminating poverty should become a national priority. Gardner believes the achievement gap will begin to disappear when racism is recognized as the pervasive and insidious cancer that it is, and when Americans are united in their willingness to do something about it (Gardner 2007: p.5).



Gardner's journal mostly covered the roots of the achievements gap, starting with childhood and lack of healthy adequate nutrition, which mainly affected the normal brain development; we can add to this, poor medical care of children that increases the problem. Low-income families don't have health insurance; they can't afford a physician visit, and many of them aren't aware of how to take care of healthy young children, and keep them healthy.

Another main part of this journal about the "internal versus external locus of control," I apparently can see in my students, in Honor class when students do poorly on the exam they may blame me or the hardness of the exam, but later on they may admit that they didn't study enough. On the other hand, in lower level classes, especially when it comes to black students, I see the "external locus of control." They tend to blame the teacher, subject, or even the climate for not scoring high on the test. This kind of attitude plays a main role in minority students' achievements that find their escape in blaming everyone else but not themselves.

The last factor that was mentioned by Gardner was the attitude in the United States about eliminating poverty, and makes it a national priority. This hope seems far away right now, where no one cares about these poor students but blames them. The people of the United States have suffered from racism for many years and are still suffering in certain areas. It will take many more coming years to eliminate the bitter fruits of racism in this country.

"The solution to the problem of the achievement gap lies within each one of us as a citizens and within each of us who teaches" (Gardner 2007: p.5). Gardner believes in

teachers, he believes they can do a lot when they believe in their students. It's not only when teachers believe in their students and in their capability to do the work, but also students need to know that their teachers believe in them and in their ability to do the work. Gardner also emphasizes on making learning a fun process, he assured it's not an easy task because teachers will have to deal with the dual anxiety that can come from not having a manual to guide them while they have a principal who insists that they should use the prescribed text. "Fun means using games and manipulative. And for me, a key part of making learning fun is interspersing brain games and other short, quick activities throughout the day" (Gardner 2007: p.5).

The last article not only shows a positive picture, but also provides solutions the achieving problem. A study made by Doyle, Mary C, and Feldman, they conducted their study in four high schools in Boston area. The pilot high schools, a part of the Boston Public School district, are schools that have been found to successfully educating low-income students and students of minority.

This type of school succeeded to meet the needs of low-income and minority students. Students chose schools based on perceived fits of specific academics, support, and school culture characteristics. "There are several arguments for increasing student voice in the school choice debate and school reform in general. Students are a critical part of schools and the educational system. Students should be a part of education reform because it's they who experience and are served by schools. (Cook-Sather, 2002; Cushman, 2003; Hatchman & Rolland 2001; Rudduck & Demetriou, 2003).

School Choice offers different style of education, where every student can find what he or she looking for, School Choice provides both college and career preparation, which is missing in the public education system, where school go either way, and provide a ridged system for certain academic achievement, regardless individual differences and student needs.

Also, School Choice focused on the teacher-student relationship, where teacher pay attention not only to the academic needs but also to the personal needs.

## **Methods**

Ten questions anonymous survey was used in this search, the survey was giving to a College Preparatory Chemistry class, at the end of the third marking period, school year 2006-2007.

Total number of student in this class is twenty-five students, eight black students (five males, and three females), and seventeen white students (seven males and eight females). This class in one of four College Preparatory Chemistry classes I'm teaching this school year 2006-2007, and has the highest number of minority students.

The survey questions are basically about student's gender, race, number of their household members, citizenship, primary language spoken at home, and the total household income.

Many journal articles have been reviewed; only four of them have been covered in this paper with a reflection.

This study was made at Brandywine High School, Brandywine School District, in  
Wilmington, DE

## **Student Body Information at Brandywine high school**

The student body includes many different races. Thirty-four percent of the students are African American, fifty-nine and half percent are white and, two and half percent are Hispanic/Latino, three and half percent are Asian and a third are others.

Approximate school enrolment 1190 students, seven percent of them have learning disabilities, thirty percent are qualified for federal lunch program, and twenty-one percent are below poverty level, and less than one percent has limited English proficiency.

Last year Brandywine has eighty-seven percent graduation rate, forty-four percent attend four-year colleges upon high school graduation, and twelve percent attend another educational institutions (community college, trade school, etc.).

Brandywine high school would be classified as a public neighborhood school, located in suburban area, school physical building is in a middle of highly economic developments, high income (at least \$75,000), some other students come from the city area and live in very poor low economic and dangerous neighborhood.

**NCLB** rating for Brandywine:

As for now Brandywine academic progress is under school improvement.

### **Science Department**

Consists of eleven teachers, two are black nine are white (none Hispanic nor Asian). Six of them have more than five years teaching experience, three of them have between two and five years teaching experience, and two teachers have more than fifteen years teaching experience. In my Science department there are two other chemistry teachers other than myself.

## My classes and my School:

**Classes:** I'm teaching five Chemistry classes, one honor level and four CP levels.

My classes sizes max twenty-eight students, and the smallest one is twenty-two students, also I'll teach honor lab in the second semester (school year 2006-2007) to reach total six Chemistry classes.

## Development of 2006-2007 School Improvement Plan

### 2006 DSTP Participation

BHS met or exceeded the 95% DSTP participation target for all cells:

- All Students
- White Students
- Black Students
- White Students
- Economically Disadvantaged

### BHS Graduation Rates

Percentage of Students Who Graduated

Cell	2004	2005	2006
White	95	94	
Black	72	84	
Special Education	76	84	
Economically Disadvantaged	73	77	

### Science—DSTP Results

Percentage of Students Meeting or Exceeding the Standard

	All Students	Special Education	Black Students	Economically Disadvantaged
2005	64	10	28	29
Weighted Average 2000-2004	56	-	-	-

Mean SAT Scores of BHS Students by Family Income  
(FROM: ETS 2005 COLLEGE BOUND SENIORS REPORT)

Family Income per Year	Mean SAT Score	
	VERBAL	MATH
\$20,000 to \$30,000	418	431
\$30,000 to \$40,000	474	451
\$40,000 to \$50,000	518	488
\$50,000 to \$60,000	480	506
\$60,000 to \$70,000	494	488
\$70,000 to \$80,000	561	543
\$80,000 to \$100,000	531	518
Greater than \$100,000	565	554

Not many statistics are available about science achievement, previously on the Math and English were the only subjects used on the DSTP test, but now they have added Science and Social Studies for the sophomores. Most students believe science is not counted anyhow, this year we have dedicated extra periods twice a week as a review for the DSTP test.

### **Results and Discussion**

After having the survey back from my students, I classified it according to their race, then according to their gender, males and females. The survey is anonymous, due to the sensitivity of the topic (race, and household income), I found that, most of the students don't know their household income, I believe this survey should be designed differently, and should contain more questions to be used as indicators for the household income, such as if the student having a computer at home or not, what kind of transportations been used to come to school, and using any electronic device such I-Pod and cell-phones.

Out of eight students only two males indicates that, their household income is \$100,000 or more, while the rest of this group said they don't know.

Academic wise, only one black male is scoring above average "B", one female dropped the course, two males and a female are failing the course, and the rest have average D-C.

I found it's really hard to make the connection between the low-income students, and their achievements in my Chemistry class, even though I can see it clearly how most of the minority students poorly accomplished work in the class.

Neither the survey, nor the journal articles, can provide strong evidence about poor achievement in science classes and poverty, even though some journal articles offers many reasons behind low achievements in science classes, or in school work in general. One of the studies about race, poverty, and teacher mobility, even though many teachers would think in this way, and would leave their teaching job to another career, or seek another high-income school, but this is not the fact in Brandywine high school. Teachers at Brandywine High School are highly qualified, have or seeking higher educational degrees, they spend many years teaching in the same school. In Brandywine High School teachers mobility are due to another reasons like retirement, or moving to another state, but not because the low-income or poor students.

I strongly agree with Gardner about some of his ideas, Gardner started with the problem roots; he talked about lack of healthy adequate nutrition, which mainly affected the normal brain development. Gardner's idea of internal and external locus of control, and



how students behave in the classroom, it perfectly fits how successful students see themselves as primarily responsible for their successes and failures, while low-scoring students blame everyone else but not themselves, about not only their grades but also their unaccepted behavior.

I think we need to look at poverty or low-income area as a unique culture by itself. Minority students from low-income area have their own culture, loud voices for these students, or talking while others talk is totally accepted among their culture, father more it's approved.

From my personal contact with some of minority students' parents, I can tell how much they care about their children, and how much they trying hard to push them to achieve in the classroom, even though some of these parents tend to use violence with their children, and go for hard and harsh punishments. As a result, unaccepted behavior from these students being noticeable in classrooms.

It seems like students being highly affected by their peers more than anything else, neither their parents' control, nor school efforts. Low income student need in the first place to learn how to change their attitude from being external locus of control to be internal locus of control, blaming others or situations will not help anyhow but taking control will make the real change in life.

Last thought on Gardner paper about the attitude in the United States about poverty, even though Gardner pointed to certain attitude among the nation, but he didn't give a solution to make this change.

SAT scores for 2005, shows a correlation between income and scores, the higher the household income, the higher the SAT scores, even though this table didn't show the number for white students and the minority students and their scores.

Another reason affect minority students and their achievements in science classes, is lacking of mathematical preparations is another reason for receiving low marks on the SAT. The subject of this study (minority students), are really struggling with any sort of math work, lower level math highly affected achievement in Chemistry class.

Lacking of access to the technology, which is due to the low-income, is another factor affect student's achievements. Science classes now use a lot of technology, many labs being done using computers probes; many paper required the use of the Internet, search engines, graphs and certain software. Many teachers use their own web sites to post homework on line. Personally in my classroom, I ask my students to take quizzes online, type lab reports, write search paper, and work in groups, all these kind of work required the use of technology which is not available in every house, but I encourage my students to come and stay after school hours in my class to finish their work.

Minority students especially from low-income area don't receive academic support from their parents, from the phone calls and parents meetings, parent count totally on the school for help, they may ask their children to stay after school for help, or to do extra credits work. But on the other hand, most of the students either involved in sports, or work (which is good in most cases), or just want to leave early to catch the school bus to go home, students don't extra time in the school, while being home they lack the access

of academic help, and the resources, it seems like students being under too much pressure and this reflect on both, their academic achievement and their behavior.

In this Chemistry class, black students don't like to share nor to participate in the class, while a student being asked to answer a question, especially a female it seems like kind of punishment to her, also black males tend not to share unless one of their peers initiate to share and participate, he gets all the support from the whole group (black students).

For minority students they work as a team, either win together or lose together, for them it's better to stay as a strong team than to win the battle.

I can see how minority students in this class eager to learn, some of them trying really hard to pass the course, while others gave up, when get involved in a scientific discussion I can see the hunger for science and for understanding the concept behind every activity in their daily life.

As a part of the solution for the poverty- poor achievements in classroom, teachers still the main role and main tool; teachers' faith in their students, and in their abilities to do the assigned tasks is a magic key for a life change. High expectations leads to great work, while low expectations makes both teacher and student losing abilities and motivations to do any work. Experienced teacher know how to use differentiated instructional with students, not only academically, but also culturally, when teachers understand students 'culture, then they can react correctly to their students behavior as they reacts to their students' needs. We all are different learner, and if we learn how to deal with students

with special needs, then we need to learn how to deal with and how teach students from different ethics, different environments and different cultures.

## Conclusion

From articles reviews we can see for sure a direct relationship between poverty and achieving in classroom, many factors are behind this low achievements as been discussed before, it seems like some factors out of control, we can't go back and heal the roots of poverty problem, but we still have to face and deal with the product of poverty.

Students who are coming from low-income areas, or who live under poverty line come to school with a big package, they seek help and support, they lack in their homes many advantage of technology and decent life, but they are able to do the work.

Students of minority need an extra help in both subject math and science. Coming from poor environment doesn't mean you can not do the work, but may means you need to be motivated to do this work, lacking motivation at home should be understood by teachers.

Students for minority are lacking self-esteem, they need encouragement and support.

Many studied have been done through the United States, show that students of minority who come for low-income area, can achieve as their peers in high income schools, one of the successful program through the country is school of choice, these children are able to

do the work, and have a bright future, they just need someone to care about them, at same time someone be able to support them in the right way.

Science class can fit everyone, many subjects and majors, it's the science of life, when students see the connection of science and their lives they get involved, in different levels and different ways.

Last but not least about students for minority, I believe their assessments need to be according to their growth and their level of learning but not according to the standards.

## *Work Citation*

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