Increasing Minority Success in the Mathematics Classroom

An Honors Thesis (HONRS 499)

By

Sarah Bremner
and
Jennifer Ferger

Thesis Advisor
Dr. Kay Roebuck

Ball State University
Muncie, Indiana
May 1999
Spc 111
Thesis
LD
2489
.24
1999
.8745
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract and Acknowledgements</td>
<td>1</td>
</tr>
<tr>
<td>General Introduction</td>
<td>2</td>
</tr>
<tr>
<td>The Importance of Role Models</td>
<td>3</td>
</tr>
<tr>
<td>Multicultural Education</td>
<td>12</td>
</tr>
<tr>
<td>The Reeducation of Teachers</td>
<td>20</td>
</tr>
<tr>
<td>Conclusion</td>
<td>28</td>
</tr>
<tr>
<td>Appendices</td>
<td>33</td>
</tr>
<tr>
<td>Works Cited</td>
<td>42</td>
</tr>
</tbody>
</table>
Abstract

As the struggle for equality continues in politics, business, and social interaction, it has become apparent that the struggle exists in education as well. This project entails trying to find methods to increase minority success in the mathematics classroom.

This project presents three avenues through which success will be increased. These include increasing positive role models in the mathematics classroom, the introduction and/or expansion of a multicultural curriculum, and the reeducation of professionals in the field. In addition, this project includes a guide for schools that will allow assessment of their curriculums as well as providing resources for the implementation of new programs.

Acknowledgements

We would like to thank Dr. Kay Roebuck for her time and dedication to our project. Dr. Roebuck has served us in different capacities over the past four years including advisor, professor, and mentor. Although many individuals demanded her attention this semester, she continued to support us through our project’s completion. We would also like to thank Dr. Charles Payne for his expertise in multicultural education as well as access to his extensive collection of multicultural materials.
General Introduction

As the struggle for equality continues in politics, business, and social interaction, it has become apparent that the struggle exists in education as well. Statistics from the National Center for Education Statistics show that minority students in general score lower on mathematics portions of standardized tests. These findings present the need for uncovering ways to lessen the discrepancy in scores. Although increasing minority success in mathematics is the ultimate goal, there are many initial tasks that need to be accomplished before that goal can be reached. Research has presented three avenues through which success will be increased. These include increasing positive role models in the mathematics classroom, reeducating professionals in the field, and introduction and/or expansion of a multicultural curriculum. In order to ascertain if these items have been a factor in the success of minority students, a survey was conducted of university students. Along with these findings, a guide to aid schools in assessing and altering their curriculum to make it more inclusive for all students will be included. There are many ways educators can increase acceptance. Through role modeling, inclusive curriculum, and educating faculty about the diverse population of students, success can be ensured.
The Importance of Role Models

A model is defined in Random House Webster’s College Dictionary as "a standard or example for imitation or comparison" (870). It would follow that a role model is a person who models roles for imitation. These roles can fall into many categories such as: scientists, doctors, parents, good citizens, and athletes. "Compelling data on job inequities suggest the need to use role models and other strategies to break down career stereotypes" (Pevonka, Griffin and Curicio 26). Teachers have been looked at to provide students with images that combat such stereotypes. In 1983, Baker defined the unique role of the teacher as the:

"Individual who determines how and when students begin to explore the pressures in society and discourage racist and sexist attitudes. The attitude of a teacher is crucial in helping students develop attitudes that will prepare them for a harmonious existence in a society that is culturally diverse." (43)

As a result of Baker’s definition, teachers are expected to act such that when emulated, students will succeed at a higher level. This expectation leads to teachers being held accountable for modeling a myriad of roles for students.

When discussing the issue regarding the lack of race and gender role models, Pevonka, Griffin, and Curicio state that "school and business partnerships can be a source of such role
models, who might be tapped to act as mentors to students. Or (one) might use videotapes, slide shows, and films that present images of women and minorities doing successful, satisfying work in the middle and upper levels of their fields (28)." If a teacher is unable or uncomfortable to act as a role model for a given group, then it is in the best interest of the students for that teacher to tap into the resources of the community to provide such guidance. For example, a white, male, science teacher may want to provide role models for his female or minority students. He could do this by seeking out people in the community who hold prominent jobs in the field.

There is a sixteenth century proverb that states: "Example is better than precept." "By observing and imitating models we learn all kinds of social behaviors. To persuade children to smoke, expose them to parents and older youth that smoke. To encourage children to read, read to them and surround them with books and people who read them" (Myers 281). This observational learning filters into schools as well. If schools want students to become productive citizens, they need to show them how. Albert Bandura, the pioneering researcher of observational learning, stated "learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do (Myers 281)."
While looking at research is a vital aspect of education reform, student input brings research to life. To gain student perspectives, a survey was conducted in November 1998 at Ball State University (Appendix 1). The participating groups were predominately minority organizations, such as Asian American Student Association and Black Student Association (Appendix 2). Within the surveyed population ten ethnicities as well as eighteen major fields of study were represented. Of those surveyed, 57% stated that role models influenced their career choice (Appendix 3). Half of these role models came solely from the education profession including teachers and counselors, while 28% looked to parents as role models (Appendix 4). Parents are expected to model various attitudes and roles to their children at a young age. However, when student reach school age, they need the modeling to continue, or commence if it has yet to begin. This is where teachers are looked at to step in. "The good news is that prosocial (positive, helpful) models can have prosocial effects" (Myers 282).

Research has shown a lack of role models for minority students in particular. "Most of the attention has been focused on the problems of young black males in inner-city school, but the problem exists in smaller school districts as well" (Walker 773). "These students need coaching,
encouragement, and the belief that successful careers can be theirs" (Pevonka, Griffin, and Curcio 20). Also according to Pevonka, Griffin, and Curcio, role models play a significant part in fostering such aspirations.

The lack of role models for minority students can be seen most prevalently in secondary schools. As research suggests, minority success in the mathematics classroom needs to be increased. One possible solution to the problem is increasing minority representation among the education profession. This includes both teachers and school administrators. As discussed earlier, students learn by example. Currently there are discrepancies in amounts of minority representation among students and faculty. In the state of Indiana discrepancies are found in districts across the state. According to the Indiana Department of Education percentages of minority faculty can vary as much as 30% compared with those of minority students. Locally, during the 1997-1998 academic year, Muncie Community Schools posted the minority student percentage at 22.3% of the entire student body while the percentage of professional minority staff was 6.0% of the whole. Indianapolis Public Schools followed the same trend with minority students comprising 63.4% of the student population while the minority staff population comprised only 22.7% http://ideanet.doe.state.in.us/(Appendix 5). Similar
trends exist in many districts across the state of Indiana as well as the neighboring state of Ohio (Appendix 6).

Researchers have provided possible explanations for lacking representation among minority populations. One reason cited by Hawkins is supply, demand, and recruitment: "the growing minority student enrollment in public schools—a product of the post-war baby boom, high fertility rates in certain minority groups, and the influx of immigrants to the U.S.—has increased the demand for minority teachers" (74). One finds that this effect is circular because "without sufficient exposure to minority teachers throughout their education, both minority and majority students come to characterize the teaching profession...as better suited to whites" (King 120). Because of the discrepancies in representation, growing numbers of minority students are seeing fewer minority teachers, creating an unending cycle.

While it is optimistic that 85% of the "Role Model" survey participants witnessed minority faculty in their schools, it is discouraging that only 33% encountered minority faculty within the mathematics department (Appendix 7). This leads to the need for more minority representation in the mathematics classroom.

Though all minority group representation must be increased, much of the research has focused on African-
American representation specifically. The lack of "African-American teachers in the teaching process has been and continues to be a serious problem confronting the education profession." (King 115). Chance, Morris, and Rakes site three possible factors leading to African-American under-representation in educators:

- African American students who are most likely to have the background experiences to work with children from diverse backgrounds are not electing to work in school with high concentrations of African American children because they are actively recruited by all systems in the state.
- Many minority teacher candidates lack the background in cultural experience needed to work effectively with children in inner city or children in poverty.
- A significant number of minority teachers who have more than 30 years experience are eligible for full retirement benefits (386-387).

This trend in decreasing representation of minorities in the education profession brings about a need for increasing the number of minority group educators. The presence of minority teachers in the schools is priceless for all groups of students. Haselkorn states "the need continues for teachers with multiethnic, multicultural backgrounds to serve as role models for children of all ethnic and cultural backgrounds"(2). The Education Commission of the States also supports this belief citing
"because schooling provides the earliest near-daily exposure of children to life outside their homes, a diverse teaching force allows all students to understand people who come from backgrounds different from their own and to see persons of different cultures in leadership positions" (qtd in King 120-121).

Specifically, minority students benefit greatly from seeing role models with similar backgrounds and life experiences. Though the ability to succeed may be intrinsically motivated an extrinsic motivation from their teachers is helpful. A major factor in students’ self evaluation of success is through the physical presence of teachers of color. Minority group teachers serve as symbols of success that enhance the curriculum which leads to success by students of color (Solomon 397).

Perhaps the success of minority group students relies more upon positive reinforcement than other factors. The reinforcement of viewing success daily fosters an environment of potential success. Minority group teaching perspectives are needed to contribute to "achieving pride, equity, power, wealth, and cultural continuity” (King 117). Communications between African American students and teachers helps students become empowered about their own abilities to succeed. (King 118). According to the Joint Center for Political Studies, "African Americans have strongly affirmed the role of
education as the most prominent factor in improving the life circumstances of African Americans" (qtd in King 117).

Minority teachers often feel responsible for the education of students from similar backgrounds. This occurs to promote equal opportunity thereby creating a more cooperative community for all individuals.

The need for minority educators is further evidenced by those currently in the profession. According to one minority teacher "the racial minority kids are more comfortable with me. They're polite to me, let's put it that way. They cooperate more" (Carr 75). Another adds "students of color find it easy to talk to teachers of racial minority. They can not fool me. I may know where they are coming from" (Carr 75). Caucasian teachers also noted that racial minority teachers play an important role in legitimizing the education system for racial minority students (Carr 75).

It is clear that role models play an important part in the success of all students. However, in order to increase the success of a particular group, there must be a model of similar background available. This can be accomplished in a variety of ways. First minority representation in the education profession must be increased. The curriculum also needs encompass the knowledge that role models are vital to success. This can be accomplished by including examples of
successful, diverse individuals in mathematics teachings. Combining these efforts will increase the success of minority students in the mathematics classroom, allowing the cycle of underachievement to be broken.
Multicultural Education

Research has shown multicultural education to be one way to increase the success of minority students. "Multicultural education has been the source of controversy and confusion" (Tiedt 3) for half a century. The concept of intercultural education was introduced in the 1940s "as a means to save cultural resources" (LaBelle 17). This form of education was designed to present contributions of minorities to students in hopes of preserving these cultures. The term multicultural education arrived in the early 1970s as a result of the civil rights movement. No longer were educators willing to simply give sporadic attention to diverse cultures; instead they wanted culture assimilated into the entire curriculum.

There are a number of definitions describing multicultural education. "The key to defining multicultural education lies in the root word culture" (Tiedt 3). In its educational sense, culture is defined much in the same way anthropologists would use it. Young Pai explained:

"In general terms, culture is most commonly viewed as that pattern of knowledge, skills, behaviors, attitudes and beliefs, as well as material artifacts, produced by a human society and transmitted from one generation to another" (21).

One major problem with defining the term multicultural education lies in the literature regarding the subject. It can be found that the only commonality in the various definitions
is the view that multicultural education is a reform movement designed to improve schooling for students of color. However, it is rarely recognized that most reforms targeted to students of color actually help white mainstream students. In 1992, James Banks, a leading supporter of multicultural education, asserts “multicultural education must be conceptualized as a strategy for all students” (26). He also states that this type of education proposes the idea that all students should have equal opportunity to learn in school. Since giving equal opportunity to students is simply good education, it would follow that multicultural education is merely good education. “All of education is inherently multicultural, for it is delivered by and addressed to individuals who represent varied cultures” (Tiedt xi).

In 1989 Banks stated, “multicultural education is at least three things: an idea or concept, an educational reform movement and a process” (2). Multicultural education is a reform movement trying to change schools and other educational institutions to present all students an equal opportunity to learn. These changes must not be limited to the curriculum, but should filter into all aspects of education. According to Gollnick and Chinn, multiculturalism advocates that schools are used as agents committed to:
• Promoting the strength and value of cultural diversity
• Promoting human rights and respect for those who are different from oneself
• Promoting alternative lifestyle choices for people
• Promoting social justice and equality for all people
• Promoting equity in the distribution of power and income among groups (qtd in Cordeiro, Reagan, and Martinez 15)

Since multicultural education strives for equality in education, an ideal that can never be fully attained, it must be seen as an ongoing process. This process must not be viewed as “something we ‘do’ and thereby solve the problems that are the targets of educational reform” (Banks 3).

Sleeter and Grant compiled a comprehensive five-part typology of multicultural education programs. Their five categories include:

1. **Teaching to the culturally different.** Transitions students from various groups into the mainstream.
2. **Human relations.** Helps students from all groups to get along better, but avoids dealing with social stratification and fails to link the practical and theoretical issues.
3. **Single group studies.** Teaches about specific groups but does not emphasize social stratification and doesn’t attend to multiple forms of diversity.
4. **Multicultural education.** Promotes cultural pluralism and social equality through school reform. (including curricula, materials, staff changes, etc)
5. **Education that is multicultural and Social Reconstructionist.** Prepares students to promote cultural diversity. (qtd in LaBelle 26).
The ultimate goal of a program should be to reach the fifth level. However, the third level is the most common level for educators to reside. When asked about the incorporation of multicultural education into their mathematics classrooms, 75% of Ball State students surveyed said they did not encounter such instruction. Of the 25% that did encounter multicultural education, most curriculums included both monthly and special lessons on cultural holidays such as Kwanza, Black History Month, Hanukkah, and Chinese New Year (Appendix 8).

With this plethora of definitions, many educators and administrators wonder why multicultural education is so important to incorporate into their schools. "Multiculturalism is the most common way in which the ideology or philosophy of cultural pluralism is put into practice in education" (Cordeiro, Reagan, and Martinez 15). Those who advocate the need for a multicultural curriculum suggest the need to weave the cultural backgrounds and life experiences of all students into that curriculum. "A quality education requires that all students be exposed to the variety of cultural perspectives that represent the nation at large" (Hawkins 77).
The relevance of a class may be determined by the experiences the student has had with the subject manner. Most would agree that it is inappropriate to introduce balancing a checkbook to an eight-year-old to show the relevance of addition and subtraction. Instead, the teacher may talk about toys or family to familiarize the students with addition. Advocates of multicultural education "suggest that instructional activities must be organized around and embedded in multicultural contexts so that each learner can relate his or her own personal background to what is being learned" (Carey 94). This technique creates learners more willing to participate and absorb information. As the subject matter becomes more engaging the students, regardless of color begin to thrive in the classroom. Seeing the relevance of not only math in their "world", but also the "world" in math becomes overwhelmingly important. Carey suggests that learners relate content with self-worth. This self-worth comes through the recognition of the contributions by members of their culture (94).

"For members of groups that have been the targets of discriminatory and biased practices, opportunity is enhanced by seeing people like themselves who have made it" (Pevonka, Griffin, and Curcio 28). Learning about individuals and their contributions to mathematics specifically aids in
contradicting stereotypes of the abilities of culture groups. "Teachers have the power to make children feel invisible and insignificant and that their differences are irrelevant through the choice of educational materials and teaching style" (Banks 27). "Some of the blame for squelching youngsters' career aspirations and limiting their job potential can be attributed to stereotyping. Such stereotypes become embedded in the popular culture and act as social norms to encourage or discourage certain job choices" (Pevonka, Griffin, and Curcio 26). There are many stereotypes associated with mathematics. In the Role Models survey of Ball State students, one Asian American student felt there was a stereotype for mathematics that assumed Asians would be good at it. This came to his attention because he was "not that good at math." "Inappropriate and inaccurate labeling has led many children to years of academic failure" (Swick, Boutte, and Van Scoy 76). Coincidentally, this student received no multicultural educational resources while in school.

Contrary to what some believe "all children, no matter what their cultural background learn mathematics in similar ways" (Carey 97). Many minority children are turned off at an early age because of the lack of cultural relevance, not because of lacking skill. "Children, regardless of culture, must be involved in classrooms where they can explore and
collaborate to construct their own understanding" (Davidson and Kramer 137). According to Banks, "many individual and cultural variables interact to impede the development of culturally sensitive individuals, including: cultural stereotypes, social isolation, tradition and excessive conformity" (qtd in Swick, Boutte, and Van Scoy 75). This can be carried out through cooperative learning. To enrich this learning environment the following steps have been suggested:

i. Expand cooperative learning opportunities and mixed ability grouping;
ii. Eliminate cultural bias in ability grouping and establish expectations of each child based on realizing his/her full potential;
iii. Whenever appropriate, structure classroom experiences that provide students with the opportunity to learn about their own and others’ cultures, customs, and behaviors;
iv. Structure classroom opportunities to allow students to discuss controversial issues, encouraging them to examine and understand their own and others’ beliefs, and values and attitudes (Grant and Sleeter 81).

The failure to use these multicultural teaching strategies impedes the academic success of both minority and non-minority students.

Multicultural education, though a relatively new aspect of teaching, is gaining relevance and recognition daily. In order to properly integrate multicultural education, an atmosphere of acceptance must be established between both students and teachers as well as between peers. This promotes
a cooperative learning environment that enables students to explore the cultures of others. With this background knowledge, students are more welcoming of the multicultural curriculum. All students begin to thrive in such environments; however, the influences on minority students create a newfound self-awareness that increases their chances at success.
The Reeducation of Teachers

Though the importance of a multicultural curriculum is overwhelming, one must not overlook the individuals implementing the curriculum. "Changes are required not only in the materials of the curriculum but also in the perspectives of teacher and students and in teaching methods" (Davidson 135). If the educator is resisting these changes toward multicultural programs steps must be taken to discover why. Many times the resistance comes from a lack of knowledge and exposure to multiculturalism. "Because teachers play such a central role in the kinds of educational opportunities students receive in the classrooms, their reeducation and training are fundamental to providing educational equality" (Gay 183). Both implementing reeducation programs for current professionals and modifying the existing pre-service programs within post-secondary institutions will reduce the negative effects teachers have on their minority population. It can be seen in education that the attitude of the classroom teacher can either positively or negatively effect the performance and success of any student. Misconceptions and stereotypes about minority groups can be especially damaging to the self-worth of a student. According to Johanna Nel, "'teachers' thinking, knowledge, perceptions, and beliefs can be a major
contributing factor in the empowerment or the disabling of minority students" (qtd in Walker and Chappell 203).

In the late 1970s the National Council for Accreditation of Teacher Education (NCATE) began a rigorous attempt at integrating multicultural education requirements within teacher education programs. Since that time most universities have adopted this practice. Unfortunately, many "new" educators are still not knowledgeable about the effect of a multicultural classroom on their teaching practices. Part of the downfall of existing teacher education programs is the lack of application of multicultural education. Though a student may take a course in multiculturalism, the theories are not put into practice, thereby hindering the teachers' ultimate success. Even in the 1990s Goodland characterized teacher education by:

- A reluctance to place student teachers in urban classrooms; and
- Racism in education that affects both white and black teachers (and diverse others, of course). (qtd in King, Hollins, and Hayman xiv).

Many universities are currently in the midst of revising their teacher education programs to include culturally relevant learning experiences. Schools such as Witchita State University are actively involving pre-service educators in the multicultural experience (Huber 131). Students admitted into teacher education programs must complete a four-block set of
professional courses. In the first block "students examine diversity in humans by exploring: (1) the nature of human growth and development, (2) the exceptional differences in human development, and (3) the nature of educational in a multicultural, global society (Huber 139). The third characteristic of the program is their expanded on through field experience requirements. "Requiring student teaching placements in two or more contrasting settings provides exposure to diversity, but teacher preparation programs must go beyond this to foster more enduring engagement. (Peretti 192).

One university, in particular, took this theory and put it into practice. The Developmental Teacher Education program at the University of California at Berkley realized "a pressing need for our students to supplement their coursework on multicultural, multilingual issues with direct input from our children, families, and teachers who possess relevant knowledge and experience" (Peretti 195). The program includes multiple placements to allow candidates the utmost in field experience to better prepare them to the multicultural classroom.

An increasing number of universities are creating field experiences that address issues of multiculturalism. Ball State University is one of these institutions. The Urban
Experience is designed to provide students with the opportunity to participate in an urban educational setting. Working in collaboration with Indianapolis Public School Corporation in Indianapolis, Indiana, Ball State has created a program that immerses pre-service teachers into a diverse educational community. Another institution that provides a unique multicultural experience is Indiana University. This program provides students with the opportunity to complete their teacher education program on a Native American reservation. Such collaborations forge a unified front in teacher preparation that will create stronger, more diversified educational implications that foster success among minority students.

Though great strides have been made in changing the future of education, the current state of education must also be addressed. Organizations such the National Council of Teachers of Mathematics (NCTM) are attempting to change the current state of multicultural education with immediacy. The NCTM published their 1997 Yearbook entitled: Multicultural and Gender Equity in the Mathematics Classroom: The Gift of Diversity. In the publication the Council addresses the need to change pedagogy of current teachers. The reeducation of current teachers could perhaps be the largest undertaking in educational reform. As observed in various classrooms current
educators have been the most resistant to change. Many feel multicultural education simply puts added requirements into their classroom; requirements that are not necessary. NCTM proposes three areas in which a transformation must take place (Davidson 135). One area, equitable pedagogy, refers directly to the reeducation of teachers. The Council wishes to "modify teaching approaches to make them appropriate for children from a range of cultures" (Davidson 135). In working with current educators a "barrier of the unknown" must be broken to begin multicultural implementation.

The "barrier of the unknown" mostly stems for a lack of experience and knowledge in working with individuals from other cultures.

"There is indeed a public image of political correctness that is projected to the world by most teachers: that we are fair and decent, that we embrace the diversity of our students and faculty, and that we are free from prejudices and biases committed only to doing the best jobs we can". (Kottler 20).

Indeed this image is projected, but it is practiced? With hundreds of ethnic groups represented is it possible that bias does not exist? Not according to Kottler who states "it is inevitable that a teacher, much less any of the students, would have distinct preferences towards some cultures rather than others, especially those that most resemble the teacher's own heritage." (57). A goal of multicultural education is to
incorporate all cultures into the curriculum. Therefore, educators must learn to be comfortable in their classroom as well as making their diverse population comfortable. Geneva Gay provides four primary emphases for retraining current educators to better handle the multicultural environment:

- **Self Knowledge—Education professionals need to become reflective in their practices towards students within minority groups.**

- **Understanding Differences in Cultural Values and Behavior Codes**—It is apparent when teaching diverse populations that there are differences not only between teachers and students, but also within the student population itself. Understanding these differences will aid instruction in the classroom.

- **Development of Technical Instructional Skills**—There are skills more appropriate for working with diverse students such as: questioning and feedback, cooperative learning, and auditory and visual learning.

- **Increased Public Relation Skills**—Both educators and administrators must be able to communicate with citizens in the community. This facilitates a positive relationship with parents, which provides background knowledge about the culture of their students (183-184).

Enacting all four of these suggestions will not only increase student success, but also improve the overall school setting.

The underrepresentation of minority teachers must be addressed at the post secondary level. In response to equal opportunities becoming available, many minority
students are turning away from teaching. Post secondary institutions must stress the importance of multietnic role models in the classroom. "There just aren't enough students of color becoming teachers at a time when we need them the most" (Collision 25).

In order to attract more minority students into the profession, colleges and universities must make the field of education more attractive by "providing internships at an attractive salary with plenty of professional support from experienced teachers" (Collision 25). A large body of research supports the role of historically Black institutions in increasing minority representation in the classroom. "Historically Black colleges and universities must take a prominent role, must become immediately involved in the teacher education reform movement, and must be involved in any restructuring of education" (Hawkins 81).

The reeducation of teachers is becoming increasingly important as the focus of education is turning towards multiculturalism in the classroom. Efforts must be made to reform teacher education programs as well as retrain current teachers. Post secondary institutions play a critical role in changing the current face of education. Increased exposure to diverse student populations at the
pre-service level will foster an atmosphere of acceptance and understanding. This embracing of multiculturalism can then be transferred to the classroom to be witnessed by students creating an environment of success.
CONCLUSION

According to the U.S. Center for Educational Statistics, there are apparent discrepancies between minority and non-minority student scores on mathematics portions of standardized tests. As a result of these findings, the need arises to increase minority success in the mathematics classroom. After exploring the possible sources of the discrepancies three avenues have been found to remedy the situation. Through combined efforts of role modeling, multicultural education, and teacher reeducation the gap in scores can be eliminated.

Role modeling in the classroom can occur in many different forms. Since children spend much of their time with educators, it follows that these educators become role models for many children. Positive role models are pivotal in the success of students. However, for this success to take place the student must believe the accomplishments of the role model are attainable.

For many minority students who see only Caucasian mathematics educators, achievement in math may seem impossible. By presenting minority role models both as educators and as fundamental parts of the curriculum, minority
success in the mathematics classroom will be increased. The lack of minority representation among teachers creates a cycle of underachievement in mathematics by minority students. The cycle begins with a minority student who does not witness diversity within the teaching profession. This student then creates a picture of education that excludes them. In turn, this deters minorities from pursuing careers in education, creating a deficit of minority educators, which continues the cycle. Presenting positive, diverse role models within the teaching profession is one method to break this cycle.

Introducing diverse role models within the mathematics curriculum is another way to benefit students. These role models can include historical figures as well as community members who have succeeded in mathematics. Recognizing that individuals from all cultures can succeed in mathematics is a benefit to all students, regardless of race. One advantage of this realization is the breaking down of cultural stereotypes, which creates a positive learning environment. Teachers can continue this trend by embedding culture within the curriculum.

Multicultural education has become an integral part of a successful curriculum. The correct implementation of multicultural education includes fostering a positive relationship between students, preparing them to accept other
cultures. Cooperative learning is one method of accomplishing this task. Once an atmosphere of acceptance has been established teachers can then present lessons steeped in culture. Many schools find it adequate to incorporate multiculturalism during holidays such as Kwanza, Hanukkah, and the Chinese New Year. While this is an important beginning point, integrating multicultural education daily will raise success to a greater degree.

Multicultural education in the mathematics classroom can range from lessons discussing the origins of mathematical concepts to making mathematics relevant to all students through daily problem solving. Applications can include discussing items associated with specific cultures such as economics, weights and measures, and number systems. Through these lessons the students learn about mathematics and the world around them.

Researchers have suggested action plans to implement multicultural education. The ultimate goal of multicultural programs is to prepare students to promote cultural diversity. This can be accomplished in a variety of ways. The curriculum must eliminate cultural bias, foster a positive relationship between students, and allow them to evaluate their own belief systems.
The teacher's role in such education is pivotal. Their attitudes can both positively and negatively affect the success of their students. Since multicultural education has come to fruition in recent years there are educators who were not exposed to training at the pre-service level. This creates a need for the reeducation of current teachers. Fear of the unknown prohibits teachers from engaging in proper multicultural education. Enlightening teachers about the backgrounds of their diverse student populations allow them to provide the students with a better education.

Preparing pre-service teachers for diversity is another important aspect of educational reform. By incorporating an array of multicultural experiences into their programs, post secondary institutions are producing more effective teachers. Due to the overwhelming underrepresentation of minorities in education, programs must become more attractive to all groups of students.

As education progresses into the 21st century, efforts must be increased to promote equality among all students. Currently, there are inequities in the mathematics scores of minority and non-minority students. With a growing number of diverse populations within the mathematics classroom, educators must be prepared to accommodate all students. In order to carry out the blueprint for quality education role
modeling, multicultural education, and teacher reeducation must work in conjunction with one another. The increase of minority success in the mathematics classroom can be brought about through the collaboration of these methods. This effort must not be viewed as a burden of change, but as an enactment of relevant education.
Appendix 1: Role Model Survey

1. What is your major?

2. What is your race?
   - Caucasian - Native American - African American
   - Latino - Asian-American - Other ____________

3. How large was your graduating high school class?
   - Under 100 - 100-300 - 300-500 - over 500

4. Highest math class completed?
   - Algebra I - Trig - Geometry - Pre-Calculus
   - Algebra II - Calculus - Other ________________

5. Did your school have any minority faculty?
   - Yes - No

6. Were there any minority teachers in the mathematics department?
   - Yes - No

7. Did you have any minority math teachers?
   - Yes - No

8. Did a role model(s) influence your career choice?
   - Yes - No

9. If so, what was their relation to you? Circle all that apply.
   - teacher - counselor - parent
   - professional in the field
   - other __________________________
10. Did anyone tell you NOT to pursue a career in a math-related field?
   - yes - no

11. If yes in number 10, who?
    - teacher - counselor - parent
    - professional in the field
    - other ________________________

12. Did anyone tell you TO pursue a career in a math-related field?
   - yes - no

13. If yes in number 12, who?
    - teacher - counselor - parent
    - professional in the field
    - other ________________________

14. Were there any multicultural activities such as cultural number systems, games, calendars, etc. used in your math class?
    - yes - no

15. If yes in number 14, when were they included?
    - daily - weekly - monthly
    - only during special cultural holidays, (IE, Kwanza, Black History Month, Hanukkah, etc.)
Appendix 2: Races Represented in Role Models Survey
Appendix 3: Students Influenced by Role Models

![Bar chart showing percent influenced by role models. The chart indicates that 100% of students were influenced by role models, with a higher percentage influenced by 'Yes' compared to 'No'.]
Appendix 4: Sources of Role Modelling

- Counselor: 28%
- Parent: 23%
- Teacher: 15%
- Family Member: 6%
- Professional: 28%
APPENDIX 5: INDIANA SCHOOLS

MINORITY PERCENTAGE

SCHOOL CORPORATION

-38-
Appendix 7: Minority Faculty Present in High School

Overall Staff

Staff within Mathematics Department
Appendix 8: Implementation of Multicultural Activities

- None
- Weekly
- Monthly
- Special Holidays
- Daily Curriculum
Works Cited


Walker, Paulette C. and Michaele F. Chappell. "Reshaping Perspectives on Teaching Mathematics in Diverse Urban Schools." Multicultural and Gender Equity in the