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MULTICULTURALISM: A PANACEA TO THE ACHIEVEMENT GAP IN MATHEMATICS IN PUBLIC SCHOOLS IN NIGERIA

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Abstract

Multiculturalism seeks to recognize, understand, and appreciate cultures other than one's own. Educational Researchers over the years have taken advantage of multiculturalism to bridge the achievement gap and inequality that are related to gender, exceptionality, race, class and ethnicity. Students' performance in Mathematics over the years shows that the teaching and learning of the subject has been consistently reported as poor in most of the secondary and primary schools in Nigeria. This poor performance is more profound in public school where the majority of students are enrolled in Nigeria. A critical look showed that the dearth of effective teaching and learning of Mathematics in public schools in Nigeria has been attributed to lack of resources. It is against these backdrops that this paper highlights the potentials of multiculturalism as a yardstick to bridge the achievement gaps in Mathematics teaching in public schools in Nigeria.

Keywords: Multiculturalism, Mathematics, Mathematics Achievement, Public Schools, Nigeria

Introduction

Mathematics plays a vital role in the national development of any nation. Mathematics is very relevant to science and technology as it is the language used in expressing them. Teaching of Mathematics in Nigeria is cross curricular and it is geared towards real-life problem-solving. Also, Mathematics is a core and compulsory school subject in the curricula from primary to the junior secondary and to senior secondary school levels in the Nigeria educational system (Abubakar and Bawa, 2006; Aguele and Usman 2007; Kurumeh and Imoko, 2008). Jonah, Caleb and Stephen (2012) asserts that the fabric of society has become more and more underpinned by Mathematical ideas. However, regardless of the importance of Mathematics, Olayinka (2006) describes the state of Mathematics education in Nigeria as depressing, implying that students' achievement in Mathematics at the primary, junior and senior secondary, and tertiary levels are poor. The outcry over students' poor performance is more profound at the senior secondary level because without a credit pass in Mathematics, it is

impossible to obtain admission into most courses in higher education in Nigeria. Most studies (Sa'ad, Adamu and Sadiq, 2014; Abe and Gbenro, 2014; Afolabi, 2012; Tella, 2011) have shown that public school students fail Mathematics more than students in private schools.

Sa'ad, Adamu and Sadiq (2014) *concluded that students' negative attitude toward Mathematics, anxiety and fear of Mathematics, inadequate qualified teachers, poor teaching methods, inadequate teaching materials, overcrowded classes were some of the causes of poor performance in Mathematics. The poor performance in Mathematics in Nigeria has swung more in the direction of public school students in Nigeria at the primary and secondary school levels of education (Afolabi, 2012; Sa'ad, Adamu and Sadiq 2014). Abe and Gbenro (2014) also observed that public school students have very low interest in Mathematics compared to their counterparts in private schools. This low interest has resulted to poor performance which eventually is also attributed to the lack of instructional materials. The trend is not peculiar to Nigeria alone. This is because a similar situation has been exemplified by Balfanz and Byrnes (2006), when they reported that student from high poverty and high minority areas fail Mathematics more than those from wealthy home.*

We are living in multi-facet and multi-dimensional society exhibiting multiple characteristics (Bekemans, 2015). Various factors that shows this disparity for example gender, culture, finances of parent which is the major factor that predicts the choice of school (public or private) a child will attend. It also determines the choice of school parents takes their wards to for those who choose public. The national policy of education made provisions for every child to have equal access regardless of the income of the parent. Therefore, the diversity in type of experience provided by the public school and the deficiency thereof should not make students in the school to have an experience that will exclude them from the development and national policy of education proposed for every child.

According to Bekemans (2015) economics, political and social, cultural challenges in the age of globalization have a drastic but diversified impact on societies, states, regions, communities across the world. Beekman (2015) further avers that the disparity poses a danger which commercialization of education in its contents and out puts neglect the added human enhancement of learning process.

In Nigeria, it appears that marketisation of education has made the output of secondary education to perform poorly in Mathematics. This has also decreased rapidly the number of student who goes from public secondary school to tertiary institution in Nigeria.

Furthermore, it is now a common practice for parents to withdraw their children from public schools to private school when they are about to write public examinations such as Senior School Certificate Examination. Also those who make effort to re-sit after failing in public examination prefer to do so in private schools. It should be noted that if teachers are not familiar with children's home culture and languages, they are at a greater risk of misjudging the children developmentally and teaching them inappropriately. If teachers are not educated on their backgrounds, they may reinforce stereotypes and exacerbate the gap. If great advancement is going to be made in alleviating the achievement gap, teachers will distribute most of the instructional services needed to make it happen. This advancement cannot be made if some teacher practices are widening the gap (Denslow, 2000). In the light of these, the intent of this paper is to critically look at the place of multiculturalism in terms of the potentials it possessed in closing the achievement gap in Mathematics in the Nigeria public schools.

Use of Multiculturalism in Closing Achievement Gap

It should be beard in mind that education plays a central role in development of both human being and modern societies as it enhances social, cultural and economic development, active citizenship and ethical values. Therefore, there is need to take advantage of the provision of multiculturalism in solving this problem. A study done by Dalhouse and Walker-Dalhouse (2006) demonstrates the beliefs about culture pre-service teachers have before entering a classroom. This study surveyed 92 middle to upper class, pre-service teachers before and after a diversity seminar. The results showed that these future educators had different expectations for students in urban versus suburban settings and students from different racial backgrounds. They had lower levels of comfort with Black students, a limited interaction with them, and a limited knowledge of their historical contributions. These pre-service teachers were unsure about the effectiveness of their teacher education preparation in developing the ability to teach and communicate with students and parents of different cultural backgrounds.

In the past, multiculturalism has bridged several educational gaps. For example, in the United States of America, the prejudice, hostility anxieties and racist behavior among those who do not understanding divers culture in educational setting was abolished through the development of instructional programs and practices at all level of education (Gay, 2004).

Gay (2004) stated that the importance of multicultural education cannot be over emphasized. In several ways, multiculturalism has fostered culturally pluralistic society. Multiculturalism in education takes advantage of the connection that exists between cognition and culture. Multiculturalism has also provided contextual resource material that engages all students actively in meaningful and relevant learning experiences with the Nation's

Philosophy of Education. It is important to develop a culture sensitive and child friendly resources to children in public school in Nigeria. Given the fact that the students attending public schools in Nigeria are mostly from the homes where parents are artisans, trader and very few civil servants.

In view of this, it is important to identify the numerous local practices that are related to farming, local business, household activities, children's games cultural practices, artifacts and social events that are strongly linked to Mathematics (UNESCO, 2008). Capturing the educational resources in such everyday activities that are peculiar to students in public school will substitute advanced instructional materials that are not available in public schools. This will also fill the gap which is caused by financial constraint. Multiculturalism can effectively solve the problems of Mathematics as shown in the paragraph below.

The common saving scheme among parents and student in public school is what is called *Ajo* among the Yorubas and *Esusu* among Igbos. This is a daily or weekly or monthly contribution with certain procedures which can be used to illustrate some Mathematical concepts. The first procedure is that the participants have equal chances of collecting the contribution. The choice of who takes first is determined by a random selection or balloting. The number chosen determines your turn. For instance, if three people are involved in the contribution, they are to select from a folded paper in which number one to three are written. Anyone who picks number one will be first to collect, followed by person who picks two. This can be used to teach probability. The hypothetical activities may be designed to illustrate mutual exclusion and inclusion in probability.

In addition, this scheme has a principle that if there is a collector, the first donation of the individual is given to the collector. This could be used to teach simple percentage, fraction and ratio.

Furthermore, if anyone borrows from the contribution before the expiration of the contribution, he pays certain percentages to the collector when such individual returns the debt. This can be used to teach simple interest and compound interest. In fact, the most textbooks make use of question related to banking experience which is often alien to some students in public schools. Most rural areas in Nigeria are dominated by public school and farming is the exclusive trade there. Farming has been used to illustrate Mathematics (UNESCO, 2008). For example, in the planting of cassava, the spacing is done in such a way that a close look at it shows a triangle pattern. This is a perfect illustration for teaching triangle, angles, parallel lines, construction of angles, perimeter and areas. The rows and columns of

ridges can be used to teach concept like parallel lines. The process of yield of grains can be used to illustrate arithmetic progression.

The local business obtainable in the community can be used to teach profit and loss. In addition to this, set could be taught using classification of various items in a store. Other resources that could be used to teach geometry are widely available at the local mills and weavers.

Causes of Achievement Gap in Mathematics in Public Schools

Educational Attributes

According to Denslow (2000), while it is easy to cluster the causes of performance into two general paths, the socio-cultural and educational paths, it is important to remember that these two paths are not independent and they constantly overlap. Family income, parental structure, and parental education affect where the child will attend school and what the class and racial character of the school will be. Minorities generally attend schools where the student body is composed of primarily minority students. A study done by Goldsmith in (1994) found that ninety-four percent of Whites attend separate, White schools. Almost three quarters of Black and students attend predominantly non-White schools (Ladson-Billings 2006). This has an overwhelming impact on the quality of teachers and resources found in the school. Ladson-Billings (2006) concluded that money and resources follow middle-class students. They studied the education systems in 49 states and found that the highest poverty schools in 27 of the states received fewer resources than schools in affluent communities. In 30 of the states, the highest minority districts received less money per child than the low minority districts. The race and class segregation in school makes material resources and funding different between high minority districts and low minority districts.

Family backgrounds also affect achievement indirectly through teacher expectations. It has been found that teachers have lower expectations for their middle class students when compared to lower class students (D'Amico 2001). This leads African American students to have lower expectations of themselves, ultimately leading to lower achievement. Roscigno (1998) discovered that students whose teachers believe they will attend college score 6.8 standardized test points higher than their peers. This statistics accentuates the fact that teachers' beliefs have a strong impact on the educational outcomes of their students.

Connected to teacher expectations is teacher instruction. It has been found that poorly aligned instruction appears disproportionately in schools enrolling minority students

(D'Amico 2001). Research suggests that those who teach minority students rely on drill, lecture, and memorization; ineffective techniques for low achieving students (D'Amico 2001). This emphasizes that there are inequities in the distribution of teacher expertise. In Texas, Haycock (1998) found that poor, white children have a higher likelihood of having well qualified teachers than poor black children. Students who attend predominantly minority secondary schools in Virginia are more likely to be taught by underqualified teachers (Viadero and Johnston 2000). This disparity in teacher quality explains why an A student in a high poverty school scores about the same as a C or D student in wealthier schools (Viadero and Johnston 2000). Those students who need the best teachers are getting just the opposite. These concerning statistics help perpetuate the gap and prove that there is a considerable amount of work schools need to do in order to alleviate the gap. School partially reproduces the inequalities with which children enter with family socioeconomic status and structure play out in the classroom. Education has helped achieve this through the segregation of students, the placement of expectations, and the allocation of resources. The linkage between family and educational institutions is the same linkage that produces broad patterns of societal inequality (Resnick et al. 2007).

Closing the Achievement Gap in Mathematics

The achievement gap is a complex, interacting mixture of socio-cultural and school related factors. It has been shown that middle class children are twice as likely and lower class children are three times as likely as middle class children to be raised in low income homes (Lee, 2002). A minority status in combination with poverty strengthens the probability of a low educational attainment. This is because these conditions have detrimental effects directly related to schooling. Many of these children receive inadequate health care and nutrition, they have fewer educational resources in the home, family members tend to have lower educational attainments and therefore do not know how to sufficiently prepare and supervise their child's education, there is a weak family support system, and these children tend to move more frequently. All of these attributes work against schooling and make educational success less of a priority. Wealth and the expectations of higher education accumulate over time. The expectations placed upon a particular student depend on the educational attainment of their parents and grandparents. For those children who are having a hard time finding food for dinner, completing an essay or taking a college preparatory class does not seem as important.

The importance of socio-cultural factors is affirmed in a study done by Lee (2002) who found that the low and wide gaps in socioeconomic status and family conditions narrowed

from 1970-1990 but the narrowing slowed down in the late 1980's and 1990's (2002). This acceleration and deceleration of the narrowing in family conditions closely parallels the narrowing and widening of the middle class and lower class children achievement gap. Lee concludes that socioeconomic status co-varies and is related to the achievement gap but it is not the only variable. Roscigno (1998) emphasizes these findings in his work on the racial inequalities of achievement (1998). Roscigno found a significant 6.7 point standardized test score difference in Mathematics between the achievement of Black students compared to the achievement of White students. Thirty percent of this racial gap is accounted for by family differences. When there is a one percent increase in family income, there is a consecutive increase in Mathematics scores of 0.4 points. Students, who have 50 or more books in the house, have a 2.6 point advantage than those students who have no resources in the home. Students whose parents have at least a high school diploma have a 2.1 point advantage in Mathematics and students living in single parent homes have a 0.7 point disadvantage. Roscigno concludes that socioeconomic factors do play a role in the disparity between minority and non-minority children but these factors are only part of the problem. Roscigno found a disturbing fourteen percent of the racial gap in Mathematics to be accounted for by educational processes that are not tied to family attributes.

Multicultural Teacher Training

With all these different factors, it is hard to know where to begin in closing the gap. Many believe there is need to tackle the larger socio-cultural aspects underlying the achievement gap, but research has identified educational correlates of the gap that can be focused on immediately in the classroom. It is important to attend to the inequities and imbalances existing in society overall but educators should pay close attention to these as they appear in the classroom. The National policy on education is not going to be replaced in the near future, therefore educators need to focus on what can be done to improve the education of their students. Many teachers claim they are color blind; they teach in a manner that is general across all races. In society, it may be important to have this “everybody's equal” mindset, but in the classroom this can perpetuate the gap. Teachers need to understand that ways of thinking, behaving, and existing is affected by a person's class, ethnicity, race, and language. These characteristics affect the resources students bring into the classroom and affect the way students learn. For this reason, it is important for educators to have an understanding of different races and ethnicities and the ability to incorporate these differences into their curriculum. This can be learned and reinforced through multicultural teacher training.

Goals of Multicultural Training

The goal of multicultural teacher training is to enhance educators' understanding of their students and to use this understanding to create a more comprehensive curriculum that reaches out to all students. Multicultural education should be more than an enhanced awareness; it should be a complete transformation of one's way of thinking (Bo-Yuen Ngai 2004). This should include the ability to link the conditions of others to one's own circumstances, allowing a sensitivity for different values and traditions. In the end, multicultural teacher training will help teachers show all students (minority and majority) how to develop the multicultural awareness needed for a successful citizenship in this diverse society. This will construct a mutual and respectful learning environment among culturally diverse people and create a just society for all.

Performance Criteria for a Successful Multicultural Program

There are five components that are crucial to a successful training agenda. If each component is mastered, the comfort level of teachers and their ability to influence the lives of every student will be greatly enhanced. A brief description of each component is given along with sample questions to help facilitate conversation.

Self-Discovery: The line between “we,” the middle class, and “they,” poor people needs to be replaced with more appropriate distinctions about ethnic traditions and perspectives. To facilitate this, teachers need to acknowledge differences in diversity by engaging in their own self-awareness and sensitivity. If educators are going to bridge the gap between themselves and their students, they first need an understanding of their own background and beliefs. This can be accomplished by having teachers analyze their own race/ethnicity, social class, religion, gender/sexuality, language, and learning ability. During this process, educators will be able to realize and confront their own prejudices and stereotypes. This may require an unlearning of misinformation and stereotypes educators have internalized about others and themselves because of the media or other forms of institutionalized discrimination.

Once educators have an understanding of themselves, they can move to connecting this understanding with the lives and cultures of their students. A focus on one's own experiences, privileges, and struggles in relation to one's students will help to see oneself as a racialized being. This new sense of self will allow for an expansion of one's reference group to include others, including one's students. Once this is realized, teachers will be able to reflect on the racial composition of their school and community in an effort to realize the

discriminatory school practices and policies that may be at play.

This realization will help educators step into the shoes of their students and gain a deeper understanding of the beliefs and feelings their students bring into the classroom. This stage of training will give teachers the ability to recognize differences among perspectives, experiences, values, and beliefs of their own culture compared to those of their students, in order to see the color of their students and the diverse interactions that are happening in their classroom. How does my own school treat minority students? Are there any programs that are biased for or against minority students and how can these programs be better adapted? Can I really tell a person's race or culture by just looking at them? How are my beliefs shaped by other individuals' in my life (i.e.: parents, significant other)? How have I incorporated their beliefs into my own and where did my own personal beliefs come from? Where do my students' beliefs come from?

Identity of Students: Teachers may see students different from them as “others.” Grouping students together under this label sets up an unhealthy dichotomy between the teacher and students. This dichotomy prevents teachers from truly understanding their students' learning styles and abilities. A way to truly understand the students is by realizing the connection between the community students are from and the students themselves. This connects community experiences to the way students encounter education in the classroom and gives the educator an understanding of his/herself in relation to the students. Gaining a deeper understanding of the students also helps educators empathize with the students. Empathy helps put the teacher in the students' shoes and allows the teacher to take on the perspective of another culture. Empathizing with students is different from pitying them. It is not about “those poor students.” It is about understanding the students on a personal level. Teachers do not need to “save” their students, but they do need to create a caring and supportive learning environment that applies appropriate pressure to perform.

Many teachers may feel sorry for their disadvantaged students and give them lots of emotional support without pushing them academically. This stage of training hopes to show the importance of maintaining an environment that does not exacerbate the minority gap but instead of fosters a supportive setting that encourages growth and achievement. Are my actions conveying empathy or pity? What is my personal level of emotional involvement in my students? How can I be emotionally invested while still maintaining an academically rigorous classroom?

Bridging Theory and Practice: Multicultural teacher training needs to include an element of fieldwork or observation of a successful multicultural classroom. This stems from the belief that teachers need an interaction or immersion into an environment that is inconsistent with where they went to school. This will permit all the discussions and self-reflections during teacher training to be realized within a classroom setting. The ideas and accomplishments that are made during teacher training will seem obsolete if they are not acknowledged in a true classroom setting. This stage hopes to give educators more confidence when preparing to enter their own diverse classroom.

Infusing Multicultural Aspects into Own Curriculum: Once educators have mastered the stage of self-discovery, they can use this to build a deeper curriculum that encompasses the lives of everyone in the classroom. With a new sense of what it means to be a racialized being and interact with a diverse body, teachers should try to infuse this knowledge into their own curriculum and encourage their students to come to the same actualization. The education structure in schools is based on the dominant culture's values and beliefs and this show through the curriculum and materials used in the classroom. Teachers need to understand that using classroom curriculum based on the dominant group marginalizes minorities and decreases learning ability. Curriculum can be created by either analyzing the existing curriculum and materials for bias or adapting to correct the bias or by developing a new curriculum that takes advantage of the knowledge about the local community. A new curriculum should include social, economic, and political realms that encompass minorities' lives in an effort to develop student's awareness of the organization and function of society that embraces and maintains inequalities.

Reflection: Reflecting on diversity issues in the classroom transforms these issues into knowledge and skills that educators can utilize in the future. Exposing teachers' awareness and opening their eyes to diversity allows them to use this expanded knowledge to become researchers and learners in their own classroom. Teachers need to think back over situations in their class, analyze what they did and why, and consider how they can improve the learning for all. This requires an ability to be adaptive to different situation and this ability cannot be based on assumed superiority or inferiority. This adaptive ability helps nurture skills that assess one's own growth and progress which are essential in maintaining a successful multicultural outlook. This will help to continually strengthen one's own knowledge about issues of diversity.

Conclusion

This paper has examined the potentials of multiculturalism in closing the achievement gap in Mathematics in the Nigeria public schools. It has considered multiculturalism in and achievement gap; causes of achievement gap in Mathematics in public schools; multicultural teacher training; goals of multicultural training and performance criteria for a successful multicultural program. The paper concluded that students in public schools have no reason to fail Mathematics if the teachers can creatively use events and cheap materials to teach Mathematics.

Recommendation

It is recommended for Mathematics educator to carry experimental research to determine the efficacy of these multicultural resources suggested in this study. Various researchers in Nigeria should also profile all the multicultural resources available in all the geopolitical zones in Nigeria and integrate it into the appropriate topics they can effectively teach in the Mathematics curriculum. Teachers should also look inwards rather than complaining for the lack of instructional materials.

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