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Language Contribution to Inequality: African American Female Students' Self-efficacy and Math Anxiety

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Abstract

This paper examines language contribution to inequality through the lens of African American Female Students' Self-efficacy and Math Anxiety. Studies have defined Self-efficacy as one's perceived ability and capability, and that it builds on the language and culture around students. Research stated that low levels of math literacy and self-efficacy beliefs are related to gender, school type, class, mathematics degree, parents' educational status, and economic status. The result is a twofold dilemma for African American females, since through race, they face higher chances of math anxiety and an elevated probability of lingering effects throughout their academic experience because of gender. The article further suggests that educational systems need to incorporate self-efficacy as the theoretical framework for curriculum and standard structure. The article concludes that recommended use of self-efficacy as a theoretical framework is necessary to analyze everyday unintentional language oppression, and its manifestation through disciplinary literacy such as mathematics.

Key words: Math anxiety; Self-efficacy; language oppression

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1. INTRODUCTION

1.1 Background

New London Group (2000) states that the fundamental purpose of education is "to ensure that all students benefit from learning in ways that allow them to participate fully in public, community, and economic life (p. 9)." Research, however, illustrates the reality that education does not have equal outcomes rather than the specified aim. In light of this, gender, race, and ethnicity are thus considered implicative variables. In addition, studies have shown that among girls, 1st-grade math anxiety negatively predicted 4th-grade math achievement. This, however, was not the case for boys in similar scenarios considering that their attitudes and achievement toward the subjects did not correlate (Casanova et al., 2021).

Moreover, families' socio-economic status has been established as a predictive factor affecting the students' Math Literacy self-efficacy beliefs (O'Brien et al., 1999; Schnulz, 2005). The study also demonstrated that there was more anxiety and negative attitude toward math among African Americans and Latino students (Casanova et al., 2021), while Chowdhury, (2014) established a clear connection between attitudes and performance in math. The question remains, however, whether the student's attitude strongly connects to performance and why negativity to the subject is so eminent among the minority groups and lingers in females even when similar abilities and deliquesces are in question.

1.2 Statement of Problem

According to the study by Young and Young (2016) on the prevalence of math anxiety in African American female students based on racial aspects, math literacy among African American students is influenced by identity constriction based on math identity and racial identity

aspects. The study reflects the significant gaps in students' mathematics achievement based on ethnicity and race differences. According to the authors, the most common aspect is the language barrier (language oppression) and stereotyping. Besides, research has further found that culture affects self-efficacy beliefs (Bindaka & Ozgen, 2011). Nevertheless, the dilemma is twofold, especially among African American females, since through race, they face higher chances of math anxiety (Casanova et al., 2021) and an elevated probability of lingering effects throughout their academic experience as a result of gender (Geary et al., 2019). In addition, it should be noted that math literacy and self-efficacy beliefs vary by gender and that male students have increased positive results than those female students (Bindaka & Ozgen, 2011).

Consequently, the identity constraints introduce two lenses that can be considered with this dynamic. One is literacy which describes not only a limited definition of reading and writing but also a complex concept of diversity with various factors of influence such as individuality, gender, race, socio-economic status, politics, time, religious and cultural implications, and expectations among other factors. In essence, literacy includes many subjects such as mathematics that require the ability to decipher and critically think on necessary applications to produce a given objective (Shanahan & Shanahan, 2012). This will have an imminent danger to students as it will have cascading effects on their self-efficacy and, in turn, capacity. The other perspective or lens that may be considered in this dynamic is self-efficacy. Self-efficacy is one's perceived capability that influences their achievement and motivation. In this connection, it is important to address different components such as the factors contributing to Self-efficacy, the role of self-efficacy on African American females, and math literacy.

1.3 Theoretical Framework

The paper seeks to explore how self-imposed stereotypes and well-intentioned "advice" (the language of oppression) given by individuals of influence can contribute to African American female students' self-efficacy, particularly in math literacy. According to the present literature, the role of language used by all adults influences self-efficacy, affecting their math literacy and increasing their math anxiety. This has been determined through exploring and defining literacy and using the lens of self-efficacy. This is an essential lens that helps understand the influence of these self-imposed stereotypes since three out of four components of self-efficacy are externally driven or vulnerable to external factors.

Bandura (1986) asserts that self-efficacy is one's perceived ability and capability. It affects the students' choices of activities, an effort expected persistence, interest, and achievement. Self-efficacy has four sources: actual performances and how they previously performed; Vicarious experience, which includes how others perform; Forms of social persuasion, social beliefs, and expectations; and physiological and emotional status, which entails strong emotions that can trigger success or failure. Again, it may be regarded as a concept nurtured by extrinsic factors but is perceived as an innate characteristic. The effects are motivation, learning, self-regulation, and achievements (Bandura, 1986). The environment shapes self-efficacy, which influences attitude and learning performance.

Research has demonstratd that there are more anxiety and negative attitudes toward math, especially among African Americans and Latinx students (Casanova et al., 2021). Research also illustrated female students' high-level threat with stereotypes and how they manifest in academics (Casad et al., 2017). Moreover, studies found that female students' anxiety, negative attitude, and performance linger years past the initial experience (Geary et al., 2019). Significant findings when considering the connection between attitudes and performance in math (Chowdhury, 2014). When weighing the identity constraints of race or ethnicity and the adverse effect of stereotypes facing female students, African American female students' compounded disadvantages are perceptible.

Before progressing further, it must be noted that language oppression can manifest subconsciously or through vehicles of well-intentioned advice. In addressing the racial and gender inequality that African American female students experience and understanding the capacity and manifestation of language oppression, educators need to analyze and recognize the weight of their words. Some studies have found that mathematics educators' choice of vocabulary can uplift students' attitudes and performance, reducing their math anxiety (Beilock & Willingham, 2014).

Bindaka and Ozgen (2011) stated that low levels of math literacy and self-efficacy beliefs are related to gender, school type, class, mathematics degree, parents' educational status, and economic status. Bindaka and Ozgen (2011) also found that Math Literacy and self-efficacy belief levels vary due to parents' education and gender. Moreover, families' socio-economic status is a predictive factor affecting the students' Math Literacy self-efficacy beliefs (O'Brien et al., 1999; Schnulz, 2005). The reality is that options for change on most of these variables are limited; however, an approach of focusing resources on variables that are susceptible may result in tangible and measurable improvements. Such variables include schools, class, and school culture. Since research found that culture, class, and school affect results on self-efficacy beliefs (Bindaka & Ozgen, 2011), educational institutes can focus their trajectory for improvement in their direction.

1.4 Purpose of Inquiry

The paper seeks to explore how self-imposed stereotypes and well-intentioned "advice" (the language of oppression) given by individuals of influence can contribute to African American female students' self-efficacy, particularly in math literacy. This paper examines language contribution to inequality through the lens of African American Female Students' Self-efficacy and Math Anxiety. The purpose is to highlight the need to see how African American female students' lived experiences were indeed influenced by school staff such as counselors, non-math teachers, and other school staff. This will extend to how these individuals contributed to African American female students' self-efficacy and math anxiety. In the process, the research will establish an understanding of the subject by critically analyzing math anxiety, its related behavior, exhibited attitudes, and how language influences such aspects. Through inquiry on math anxiety, the great factor of racial and gender inequality is highlighted.

2. LITERATURE REVIEW

2.1 Stereotypes & Language of Oppression

Studies have shown that 1st-grade math anxiety negatively predicted 4th-grade math achievement for girls. This, however, was not the case for boys in similar scenarios, and their attitudes and achievement were susceptible to changing (Casanova et al., 2021). The study also demonstrated that there was more anxiety and negative attitude towards math among African Americans and Latino students (Casanova et al., 2021). This study and many others found a clear connection between attitude and performance in math (Chowdhury, 2014). The dilemma, however, remains on whether African American females, through their race, face a higher chance of math anxiety (Casanova et al., 2021) and, through their gender, greater chances of lingering effects throughout their academic experience (Geary et al., 2019). Young and Young (2016) examined the prevalence of math anxiety in African American female students based on racial aspects. They concluded that math literacy in African American students is influenced by identity constriction based on math identity and racial identity aspects. The study reflects the significant gap in students' mathematics achievement based on ethnicity and race differences. At the same time, it has been established that the most common aspect is the language barrier (language oppression) and stereotyping.

Research also demonstrates female students' high-level threat with stereotypes and their manifestations in academia (Casad et al., 2017). Buck and Buck (2019) argue that the persistence of the STEM gap among female students of color is due to the unique experiences with mathematics during the education period. The study suggests that the negative stereotype perceived by this minority group affects their performance in math, resulting in math anxiety. Schaeffer et al. (2018) discuss Math anxiety, parents' attitudes toward math, and the long-term impacts on students. It establishes the relation between the negative influence of adults in the student environment and their impact on students' attitudes towards the subject. Beasley and Fischer (2012) established a relationship between stereotypes, STEM, and their effects on females and minorities. The result of that study found that they affected all students, including white males; they affected females more, and African Americans were the most marginalized. Beasley and Fischer (2012) discussed the concept that African Americans are perhaps the most marginalized racial group on college campuses and are especially susceptible to negative stereotypes. As well as the impact and role of stereotypes threat- anxiety caused by the expectation of being judged based on a negative group stereotype.

2.2 Attitude Toward Mathematics and Correlation to Performance

Chowdhury (2014) demonstrates how students' attitudes toward math and anxiety impact their math achievement. There is a clear link between performance and math anxiety; math anxiety is distinct from and rated higher than situational anxiety (Dew et al., 1984). Tuncer and Yilmaz (2020) discussed how attitudes towards mathematics affect levels of anxiety towards mathematics, which in turn impacts success in the subject literacy. Macmull and Ashkenazi (2019) further indicated that 17% of the total population experience low to high levels of mathematics anxiety, estimating one out of five students.

2.3 Parent Influence

Schaeffer et al. (2018) discusses math anxiety and parents' attitudes towards math. This study was crucial as it deliberates on the long-term effects of adult projected math anxiety and its dissemination to children and affects subject literacy. It establishes the relation between the negative influence of adults in the student environment and their impact on students' attitudes towards the subject. Parenting styles and attitudes are associated with children's corresponding levels of math anxiety (Macmull & Ashkenazi, 2019). The parental aspects discussed include support, pressure, and perceived expectations, which significantly shape children's interest in arithmetic. The study also examines the correlation between parenting style and the prevalence of math anxiety among African American female students as part of the emotional aspect of math anxiety. Bindaka and Ozgen (2011) found that Math Literacy and self-efficacy beliefs vary from parents' education level. Further demonstrating the impact of adult influence and student learning outcome on self-efficacy and math literacy.

2.4 Subject Literacy

Before progressing and discussing math or subject literacy, a definition for literacy needs to be established.

Literacy deals with diversity, assortment, and various factors of influence, such as but not limited to time, discipline, culture, politics, economics, and social status. Literacy in general or discipline is not limited to simply accessing data but includes high-order critical thinking and constructing. For example, knowing how to read a technical manual does not constitute a person as technologically literate. Literacy requires the ability to decipher and critically think on necessary applications to produce a given objective (Shanahan & Shanahan, 2012). Literacy is time relevant, with technological evolution and dissemination of data and information through virtual platforms and media (Guzzetti & Foley, 2014); Literacy in the 21st century includes the ability to access and navigate these platforms and critically analyze information presented through these outlets.

Literacy is embedded with culture and entails multiplicity with variation (Street, 1993). In its broadest sense, it is the ability to access data using necessary tools to navigate media, platforms, and technology; to analyze, synthesize, critique, and construct information through different forms of communications by engaging in; listening, reading, writing, and speaking. Synthesized information and products encompass individuality, gender, race, socio-economic status, religious and cultural implications, and expectations (Birr Moje et al., 2020). This is embedded in culture and produces different results in varying communities, groups, and societies (Street, 1999). A notable concept was identity constraints facing African American female students and Stem disciplines. In discussing what literacy is and what it encompasses, there is a clear connection to introducing discipline literacy such as mathematics. It is also important to emphasize that it is embedded in culture, and the synthesized information and products encompass individuality, gender, race, socio-economic status, religious and cultural implications, and expectations (Birr Moje et al., 2020). Whereas gender, race, socio-economic status, and expectations have been demonstrated to be significant factors in math anxiety. It is also relevant to point out that not only are three out of four components of self-efficacy either of external influence or completely sustainable to external factors but all factors are encompassed in literacy definition.

2.5 Self-Efficacy

In retrospect, the variables of influence convey to students that their ability to meet or exceed in different disciplinary literacies, such as mathematics, are based on predetermined factors such as race and gender. African American females face a higher chance of math anxiety through their race (Casanova et al., 2021) and lingering effects throughout their academic experience due to gender (Geary et al., 2019) as this is embedded in culture all around, including parent influence, and school staff. Self-efficacy has four crucial components. These include actual performances and how they previously performed; Vicarious experience which includes how others perform; Forms social persuasion, social beliefs, and expectations; and the physiological and emotional status.

The first component of actual performances, which relates to development due to student performance, is demonstrated to not be the most significant factor as research illustrated gender differences in progress even when similar if not identical deficiencies were developed. For a girl, 1st-grade math anxiety negatively predicted 4th-grade math achievement and not the case for boys in similar scenarios. Even boys' attitudes and achievements are susceptible to change (Casanova et al., 2021), an important factor in math achievement (Chowdhury, 2014). Adding on the presence of more math anxiety and negative attitude toward math in African Americans and Latinx students (Casanova et al., 2021) produces what appear to be external contributions to a seeming internal component. And with all other components of self-efficacy being either externally influenced or completely vulnerable to external factors, there is greater research support for improving self-efficacy by examining the variables that lead to such inequality. Furthermore, the heightened effect this has on African American female students, who by all accounts face gender and racial inequality.

There is an evident gap and a need to examine how school staff other than math teachers have influenced or contributed to emotional aspects like math self-efficacy and math anxiety in African American females. Language oppression and stereotypes manifest in multiple ways, including well-meaning advice by school staff who had math anxiety or underdeveloped math literacy. Nonetheless, there is a need to explore how self-imposed stereotypes and well-intentioned "advice" given by individuals of influence contribute to African American female students' self-efficacy for learning math. The goal is to view recipients' experiences of language oppression and "advice" of failure and their influences on self-efficacy and math anxiety.

3. CONCLUSION & RECOMMENDATION

3.1 Conclusion

Bindaka and Ozgen (2011) stated that low levels of math literacy and self-efficacy beliefs are related to gender, school type, class, mathematics degree, parents' educational status, and economic status. Their findings established that Math Literacy and self-efficacy belief levels vary due to parents' education and gender. Moreover, families' socio-economic status is a predictive factor affecting the students' Math Literacy self-efficacy beliefs. The reality is that options for change on the majority of these variables are limited; however, an approach of focusing resources on variables that are susceptible may result in tangible and measurable improvements. Such variables are schools, class, and

school culture. Since research found that culture, class, and school affect results on self-efficacy beliefs (Bindaka & Ozgen, 2011), educational institutes can focus their trajectory for improvement in their direction.

Crumb et al. (2020) study of educational experiences of African American women doctoral students, working-class, and at predominantly white institutions attributed three factors that contributed to their success and reliance even in such adverse environments. These factors included their virtues, self-efficacy, and personal and academic support system. The narrative study that discusses personal experiences encompassed negative stereotypes, adverse attitudes, and rejection due to social class. Parallel obstacles and experiences to African female students faced with math literacy. Considering this study as an exemplar of educational outcomes, attaining a terminal degree is the highest degree in an academic discipline despite negative stereotypes, adverse attitudes, and rejection. Implementing factors that supported/aided their achievement in primary and secondary education can improve identity constraints and language oppression, disseminate math literacy, and decrease math anxiety. It is important to note that the study's three contributing factors to their success. The first factor was their virtues which includes their goals, aspirations, and expectation (personal and community).

Further emphasizing the role of community and the role of external factors on individual development. The second factor is Self-efficacy which is a measure that was specifically mentioned following the fact that the students had highly perceived their capability. Self-efficacy has been described as a component that is influential and significantly dependent on external influences. The final factor included an amalgamation of personal and academic factors reinforced by mentors and coaches. The results of the study are transparent in that elements produce resilience in adverse environments and lead to producing the highest academic degree possible.

3.2 Recommendation

In the process, self-efficacy's vitality was theoretically explained and illustrated in real-life examples. Self-efficacy is built on a language culture around students and adults around them. This simply isn't limited to the classroom teacher, but the entire school staff, community, parents, and more. To conclude, educational systems must incorporate self-efficacy as the theoretical framework for curriculum and standard structure. Increasing awareness of language oppression can precipitate through "well-intended advice", such as how to avoid subjects or disciplines that one is inherently "bad at ". Mistakes are essential to learning, especially in mathematics literacy. Rather than helping students avoid challenges, language that is empathetic yet reassuring in students' capabilities needs to be used. Deconstructing these elements of everyday school language oppression will address the reality of racial, ethnic, and gender inequality. Using self-efficacy as a theoretical framework is necessary to analyze math literacy and disadvantaged students' outcomes.

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