An Analysis of U.S. TIMSS 2015 Mathematics Achievement by Content Domains Across Gender and Ethnicity

Chi Yun Moon[1], Patricia Larke[2]

[1,2]*(Department of Teaching, Learning and Culture, College of Education and Human Development, Texas A&M University, U.S.A)*

ABSTRACT : *The purpose of this study was to examine mathematic academic achievement of 4th and 8th grade African American, Latinx, and Asian students by gender and content domains of TIMSS 2015 mathematics assessment.Major research findings for this study were: (1)Asianstudents reported higher mean scoresacross all content domains on both fourth and eighth grade TIMSS mathematics tests. (2) When it comes to gender difference of the 4th graders, the mean scores of African, Latinx, and Asian American boys were higher than their counterparts. However, on 8th grade tests,African American girls reported higher mean scoresthan African American boyson Geometry, Data & Chance, and Algebra. Moreover, 8th grade Latinx American girls scored higher than Latinx boys on Algebra. Conclusion and recommendations based on the results were explained.*

KEYWORDS –*U.S.TIMSS 2015, Academic achievement gap, Mathematics achievement, 4th and 8th grade African American students, Latinx students, Asianstudents*

I.   INTRODUCTION

The academic achievement gap is an ongoing topic of discussion in the U.S. education system. The definition of academic achievement gap is a continuous, pervasive, significant and persistent disparity in educational achievement among groups of students [1]. Academic achievement is usually measured by standardized tests [2]. Previous research studies show that there is a consistent disparity that produces negative outcomes depending on ethnicities, gender, and classes [1]. Such gaps of academic achievement affect later income level, matriculation to college [3], graduation rate, and the next generation's education[4]. McKensey's report [4] indicates that the gap in racial/ethnic academic achievement is important in terms of those students' own future lives, our society's next generation and America's economic development.

It is noteworthy that the majority of studies about the race and ethnicity gap typically compare the achievement scores of European American students to those of African American or Latinx students [1]. Publication of the Coleman in 1966 started to discuss those gaps in academic performance. A lot of studies have continuously reported African American – European American disparities in academic achievement.

African American, Latinx, and Asian ethnic groups have been growing rapidly in the U.S. as U.S. Census data illustrated, and NCLB has also highlighted these ethnic groups' academic achievement [5]. Briefly, from K-12, African American and Latinx students are likely to have low achievement, and Asian students tend to outperform other ethnic groups [6]. In the case of Latinxstudents, Gándara[7] insisted that the achievement gap exists for Latinx American students from the first days of schooling. When explored The Early Childhood Longitudinal Study, the author found that more than twice as many Latinxstudents fell into the lowest quartile at the beginning of kindergarten than European American children [7]. On the other hand, Asian students had a higher level of academic achievement than other groups had in most previous reports [6].

There is a widespread gender stereotype that "mathematics is for boys" [8]. This perception may be affected by the fact that girls' low academic interests and career choices in science, technology, engineering, and

mathematics (STEM) [9]. However, the gender trend of academic results is inconsistent based on research studies [6]. Some studies reported boys were likely to have a higher achievement than girls on standardized mathematics tests [10] [11], but other studies [12] insisted that there was no gender gap in mathematics among U.S. schools.

While research has been conducted on the gender achievement gap and the achievement gap among different ethnicities of students in the U.S., not much research exists examining the gender achievement gap of specific ethnic groups such as African American female students and Latinx female students [1]. The educational experience of women of color seems to be different from that of men of color and White women [13]. However, only few studies have focused on the academic performance of gender differences disaggregated by ethnicity or specific contents such as data, geometry, or numbers in mathematics assessment [1]. In Larke and her colleagues' study [1], European American, Native American, Asian American, African American, and Latinx girls scores on The Texas Assessment of Knowledge and Skills (TAKS) were disaggregated by ethnicity and content domains. The results indicated that African American and Latinx girls had the lowest mean score across subject matter.

Numerous studies about academic achievement have considered gender, grouping all male and female students together regardless of ethnicity, or considered ethnicity,such as, European American versus African American or Latinx and not identifying gender [1][14]. Individuals' educational experience varies depending on gender [13], ethnicity [1], or developmental stage [6]. However, only a few studies have dealt with how factors of ethnicity, gender, and grade combine to understand factors that impact students' mathematics achievement.Such analysis is beneficial to understanding the mathematics academic achievement of fourth and eighth grade students of color. Therefore, mathematics achievement of students of color such as African, Latinx, and Asian American students need to be explored by gender, grade, and content domains of the overall mathematics assessment. The research question that guided this study was: What is the performance of fourth and eighth grade African American, Latinx, and Asian students on TIMSS mathematics assessments by gender and the content domains of mathematics tests?These analyses are necessary to provide a deeper understanding of each group's mathematics achievement.

II.   LITERATURE REVIEW

The achievement gap has been discussed often in the U.S. The definition of academic achievement gap is a continuous, pervasive, significant and persistent disparity in educational achievement among groups of students [1]. The previous research studies emphasized that there exists a consistent disparity producing negative outcomes depending on ethnicities, gender, and classes [1] [14]. Such gaps in academic achievement affect future income level, matriculation to college, graduation rate, and the next generation's education [3].

In the case of racial/ethnic achievement gap studies, the researchers focused on the gap usually between European American and Asian students on one side, and African American or, sometimes, Latinx students on the other [6] [14]. Previous studies have continuously reported African American – European American disparities in academic achievement [1] [15] [16]. On the 2019 NAEP mathematics test, 20% of African American students and 28% of Latinx were at or above proficient in fourth grade mathematics while 52% of European American students were at the same level. At grade 8, 14% of the African American students and 20% of Latinx performed at or above proficient level, whereas 44% of European American students were placed at the same level (Education, 2020). In the case of Latinx students, they have grown the fastest and become the largest group of students of color in the U.S. In Texas and California, the school-age population of Latinx already reached one-half of all students [17]. The previous research studies [17] [18] pointed out that Latinx students are likely to have a relatively low achievement on average, and they begin school significantly behind their counterparts [17].

Based on the data from Early Childhood Longitudinal Study (ECLS), twice the number of European American children fall into the highest quartile of reading and mathematics than Latinx children, and more than twice as many Latinx students fall into the lowest quartile at the beginning of kindergarten [17]. On the other hand, Asian American students have higher grades and standardized test scores from kindergarten and tend to finish high school and attend college more than other ethnic groups [19]. Asian Americans constituted only 6%

of the U.S. population, but they comprised more than 20% of the entering Freshmen class in America's top universities [19]. Yoon and Merry [19] explained that Asian Americans have an academic advantage over European Americans when they begin school.

Gender is one of the factors affecting academic achievement. Before the 1970s, research communities became interested in gender differences in academic achievement and found that girls outperformed boys in reading during the elementary and the adolescent years [12]. By the 1970s, their attention shifted to mathematics and science in regards to a gender achievement gap [20]. Numerous studies have detailed the gender differences in math, but the pattern was not clear in the presence of several concurrent conflicting reports [6]. For instance, some studies noticed that boys outperformed girls on a standardized test of mathematics [10] [11]; however, other studies [12] reported that no gender gap in mathematics among U.S. students existed. The gender gaps in mathematics appeared to have an age-related trend. Alexander's [21] study, by analyzing the Northwest Evaluation Association Measure of Academic Progress assessment, illustrated how the gender achievement gap changes as student progress through elementary and middle school. In mathematics, the average gender gap in favor of males was growing in elementary school, but this gap was shrinking in middle school. Leahey and Guo [22] used both the National Longitudinal Study of Youth data and the National Educational Longitudinal study data in their research. Their study revealed no statistically significant gender gap exists in early ages, but a narrow gender gap in mathematics grew larger until the twelfth grade and slight gaps favoring boys from four to thirteen years old were observed.

The gender gap has been explored for a whole sample without considering students' ethnicities or specific contents, such as, data, geometry, or numbers in mathematics assessment. There are possible interrelated effects among participants' ethnicities and the content domains examined. Therefore, gender, ethnicity, and content domains in mathematics need more analyses.

III.   METHODOLOGY

To answer the research question, a quantitative research design was implemented and TIMSS 2015 U.S. national public-use data were used. These data include large enough populations with information of students' gender, ethnicity, and grade. Descriptive statistics were explored to understand each ethnic group of students' academic performance in mathematics.

3.1. Data

This study used the TIMSS 2015 database conducted by the IEA. The U.S. TIMSS data are provided in three versions: TIMSS international U.S. data files, TIMSS U.S. national public-use data files, and TIMSS U.S. national restricted-used data files. Among these data files, only TIMSS U.S. national public-use data files and TIMSS U.S. national restricted-used data files provide information of students' ethnicities. TIMSS U.S. national restricted-used data files include not only the U.S. specific data and variables, but also complete, original data, and the supplemental link files which can reveal the identities of participating schools. For this reason, TIMSS U.S. national public-use data were used in this study.

3.2. Variables

In this study, outcome variables were U.S. fourth and eighth grade students' achievement scores in mathematics.There are content domains under the overall mathematics scale. Content domains for each grade in mathematics are provided in Table 1. The fourth grade domains are slightly different from that of eighth grade because each grade has different curriculum. In grade 4, three subscales exist: 1. Number, 2. Geometric Shapes &Measures, and 3. Data Display. The number content domain includes understanding whole numbers, fractions and decimals, the concept of variables in simple equations, and relationships between quantities. The questions in the geometric shapes & measures measure students' ability of identifying properties and characteristics of lines, angles, and a variety of geometric figures such as two- and three-dimensional shapes. Through data display questions, reading and recognizing various forms of data analysis, organizing and representing the data in graph are asked. In grade 8, four subscales are included: 1. Number, 2. Geometry, 3. Data & Chance, and 4. Algebra. The eighth grade Number content domain includes more complex whole number, rational numbers,

fractions, decimals, and integers. Through Geometry questions, students are asked to analyze the properties and characteristics of two- and three-dimensional geometric figures, to understand geometric measurement, and to solve and to provide explanation as to geometric relationships. The domain of Data & Chance focuses on data organization, representation, interpretation, and chance. Students' ability to understand how the creators of charts and graphics can misinterpret the truth is also assessed. The Algebra domain includes patterns, algebraic expression, equations/formulas, and functions. Students need to solve real-world problems using algebraic models and to explain relationships related to algebraic concepts [23].

Table 1. A Comparison of Content Domains of the Fourth and Eighth Grades

Content Domains	
Grade 4	Grade 8
Number (50%)	Number (30%)
Geometric Shapes & Measures (35%)	Geometry (20%)
Data Display (15%)	Data & Chance (20%)
–	Algebra (30%)

3.3. Participants

TIMSS is designed to describe entire fourth and eighth grade students' achievement. In this study, total 9,605 fourth (n=4,785) and eighth grade (n=4,820) African, Latinx, and Asian American students were analytic participants from the TIMSS U.S. 2015 national public-use datawhich are the latest released data set as of Spring 2020.Students' information on their ethnicity was obtained from the students' self-responses to TIMSS 2015 fourth grade and eighth grade Student Questionnaire. The summary of the participants is placed in the Table 2 below.

Table 2. Participants of TIMSS U.S. 2015 Fourth and Eighth Grade Mathematics Tests

	4th grade (N=4,785)		8th grade (N=4,820)	
	Boy (N=2,320)	Girl (N=2,465)	Boy (2,423)	Girl (N=2,397)
African Americans	649	672	664	659
Latinx	1,389	1,527	1,555	1,481
Asians	282	266	204	257

3.4. Data analysis

To answer the research question, descriptive statistics were conducted. The SPSS was mainly used for analysis and International Database Analyzer (IDA) from the International Association for the Evaluation of Educational Achievement (IEA) assisted SPSS by generating SPSS syntax. The IEA IDB analyzer easily merges the various data file types of the TIMSS 2015 International Database.

IV.   RESULTS

The mean scores of the mathematics achievement tests of the fourth grade and eighth grade students by content domains, ethnicity, and gender were examined. The fourth grade scores for content domain one, Number, African American girls had a mean score 503.99, and African American boys had a mean score of 506.20. For Latinx girls, the mean score was 520.82, while Latinx boys reported the mean score of 525.02. In the case of Asian girls, they had a mean score of 603.89, while the mean sore of 617.80 was reported for Asian boys. In content domain two, Geometric Shapes & Measures, African American girls reported the mean scores of 461.08, while African American boys scored 473.19. Latinx girls had the mean score of 494.13, while Latinx

boys reported 505.05. In addition, Asian girls' mean score was 592.52, while Asian boys scored 611.87. In content domain three, Data Display, African American girls had the mean scores 494.77, while African American boys reported 497.04. Latinx girls' score was 514.49, while Latinx boys scored 517.80. In the case of Asian girls, they reported the mean score of 594.97, while Asian boys had the mean score of 604.28.

In other words, when African American, Latinx, and Asian girls compared to their counterparts on all three content domains, the means scores of African American, Latinx, and Asian boys were higher than girls across all domains on the fourth grade assessments. Moreover, Asian students reported higher mean scores, followed by Latinx and African American across all content domains. The fourth grade students across all groups except Asian boys reported the highest scores on Number, followed by Data Display, and Geometric Shapes &Measures. The Asian boys group also scored the highest mean score on Number, but their second highest score was in the content domain of Geometric Shapes & Measures. Data Display was their lowest content domain. Table 3 includes fourth grade TIMSS 2015 mean scores for content domain 1 through 3 for African Americans, Latinx, and Asians by gender. Fig.1 through 4 show fourth graders' scores on overall mathematics test and each content domain by ethnicity and gender.

Table 3. Fourth Grade Achievement by Content Domains, Ethnicity, and Gender

		Overall Mathematics Achievement	Content Domain (1) : Number	Content Domain (2) : Geometric Shapes & Measures	Content Domain (3) : Data Display
African American	Boys (N=649)	496.83 (3.37)	506.20 (3.55)	473.19 (3.74)	497.04 (3.13)
	Girls (N=672)	492.82 (2.39)	503.99 (3.06)	461.08 (3.48)	494.77 (3.11)
Latinx	Boys (N=1,389)	517.41 (2.24)	525.02 (2.39)	505.05 (2.58)	517.80 (2.31)
	Girls (N=1,527)	513.11 (1.63)	520.82 (2.01)	494.13 (2.42)	514.49 (2.92)
Asians	Boys (N=282)	614.53 (6.39)	617.80 (6.85)	611.87 (6.56)	604.28 (7.06)
	Girls (N=266)	598.98 (4.37)	603.89 (4.93)	592.53 (5.00)	594.97 (4.45)

Note: Standard errors are reported in parentheses

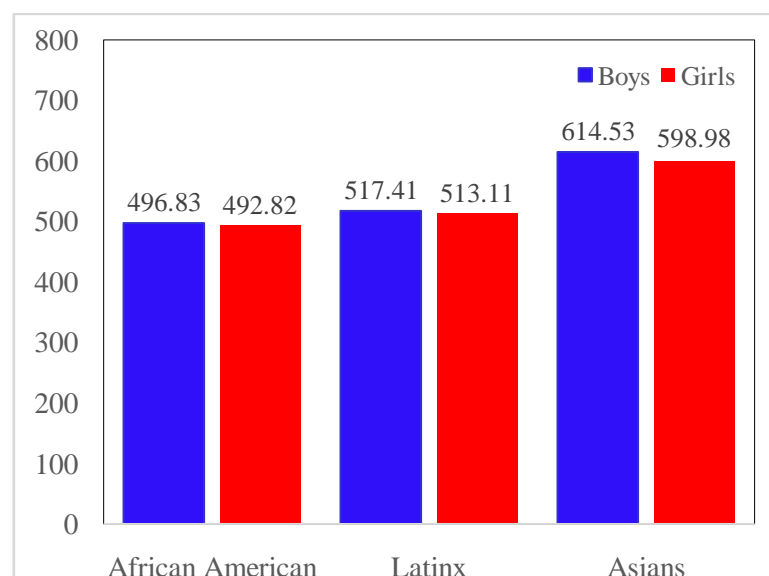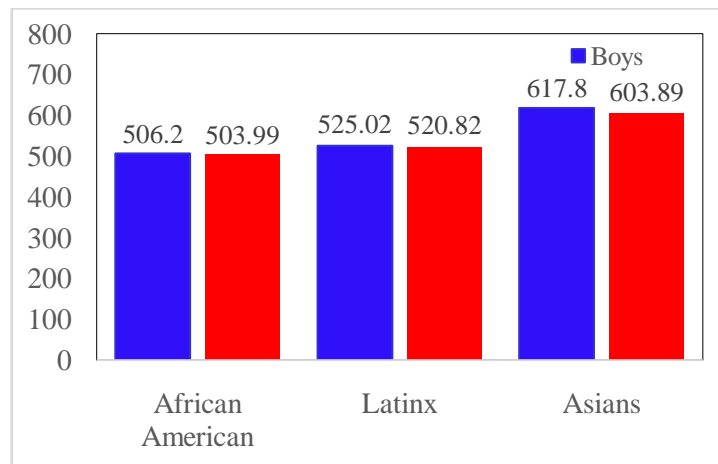Figure1. fourth grade overall mathematics achievement by ethnicity and gender

Figure 2. fourth grade content domain (1) Number by ethnicity and gender
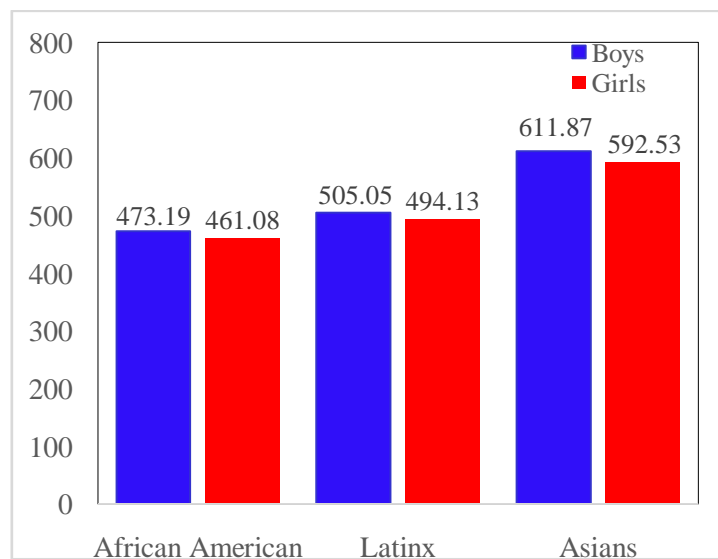

Figure 3. fourth grade content domain (2) Geometric Shapes & Measures by ethnicity and gender
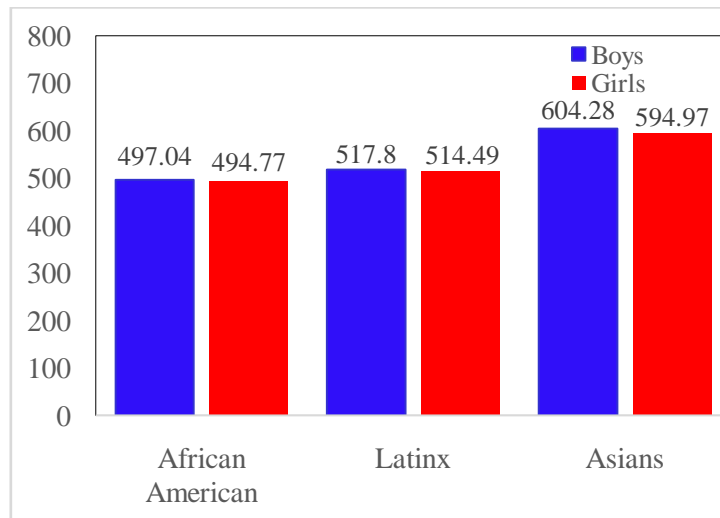
Figure 4. fourth grade content domain (3) Display by ethnicity and gender

Table 4 provides eighth grade TIMSS 2015 overall achievement scores and mean scores for content domains one through four for African Americans, Latinx, and Asians by gender. For the eighth grade students on content domain one, Number, African American girls had the mean score 460.43, while African American boys scored 464.79. Latinx girls reported 485.86, while Latinx boys had 501.06 as a mean score. In the case of Asian girls, they had the mean sore of 570.69, while Asian boys scored 589.03. In content domain two, Geometry, African American girls reported the mean score of 436.85, while African American boys scored 432.99. In the same content domain, Latinx girls reported the mean score of 471.50, while Latinx boys had the mean score of 479.40. Furthermore, Asian girls scored 570.16, while Asian boys reported 572.89 as the mean score. In content domain three, Data &Chance, African American girls reported 464.88, while African American boys scored 459.36. Latinx girls had the mean score of 484.50, while Latinx boys reported 493.71. Additionally, Asian girls scored 585.41, while Asian boys had the mean score of 594.69. In content domain four, Algebra, African American girls had the mean scores 486.42, while African American boys reported 471.86 as the mean score. Latinx girls scored 499.36, while Latinx boys had the mean score of 497.38. In terms of Asian girls, they had the mean score of 598.40, while Asian boys reported 599.35.

Taken together, African American girls reported the higher mean score than African American boys in overall mathematic test, content domain Two: Geometry, Three: Data & Chance, and Four: Algebra, while Asian boys had the higher mean score than Asian girls across all four content domains. In the case of Latinx girls, they had the higher mean score than Latinx boys in content domain four, Algebra. In other three content domains, Latinx boys reported higher mean scores than Latinx girls. All groups had the highest scores on Algebra and the lowest scores on Geometry, but the second and third highest content domains varied. African American girls, Asian girls, and Asian boys reported Data & Chance as the second highest domain, followed by Number. However, African American boys, Latinx girls, and Latinx boys performed better on Number than on Data & Chance. Figure 5 displays eighth graders' scores on overall mathematics test, and Figure 6 through 9 show eighth graders' scores on each content domain by ethnicity and gender.

Table 4. Eighth Grade Achievement by Content Domains, Ethnicity, and Gender

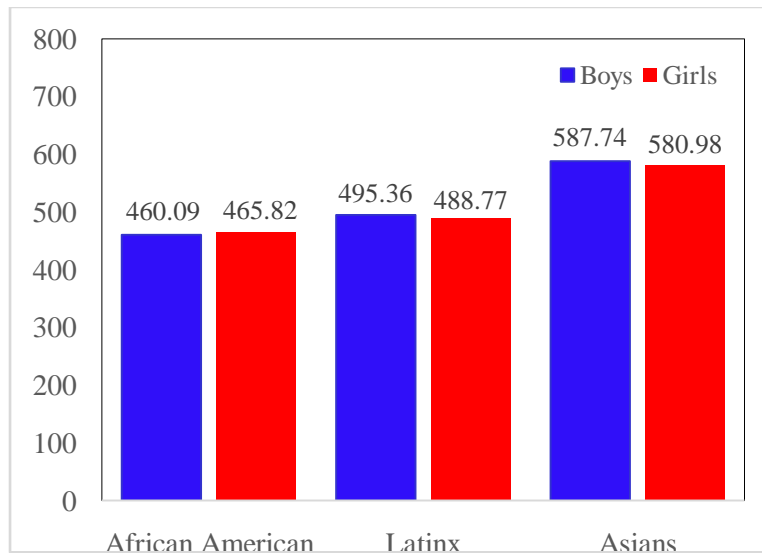|		Overall Mathematics Achievement	Content Domain (1) : Number	Content Domain (2) : Geometry	Content Domain (3) : Data &Chance	Content Domain (4) : Algebra
African American	Boys (N=664)	460.09 (2.88)	464.79 (3.12)	432.99 (2.90)	459.36 (3.09)	471.86 (3.08)
	Girls (N=659)	465.82 (2.88)	460.43 (3.08)	436.85 (2.68)	464.88 (3.63)	486.42 (3.09)
Latinx	Boys (N=1,555)	495.36 (2.39)	501.06 (2.38)	479.40 (2.51)	493.71 (3.00)	497.38 (2.55)
	Girls (N=1,481)	488.77 (2.39)	485.86 (2.23)	471.50 (2.82)	484.50 (2.85)	499.36 (2.35)
Asians	Boys (N=204)	587.74 (5.22)	589.03 (4.88)	572.89 (4.97)	594.69 (5.72)	599.35 (4.79)
	Girls (N=257)	580.98 (4.50)	570.69 (4.58)	570.16 (4.93)	585.41 (5.72)	598.40 (5.48)

Note: Standard errors are reported in parentheses

Figure 5. eighthgrade overall mathematics achievement by ethnicity and gender
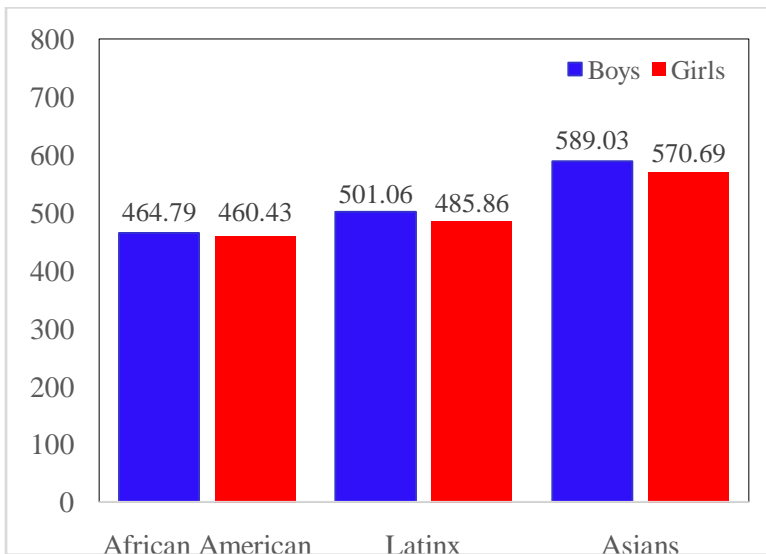
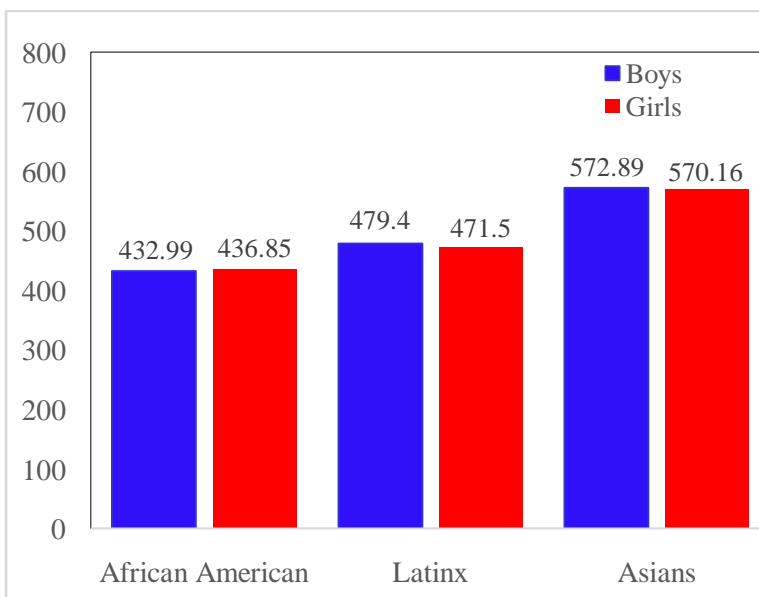Figure 6. eighthgrade content domain (1) Number by ethnicity and gender

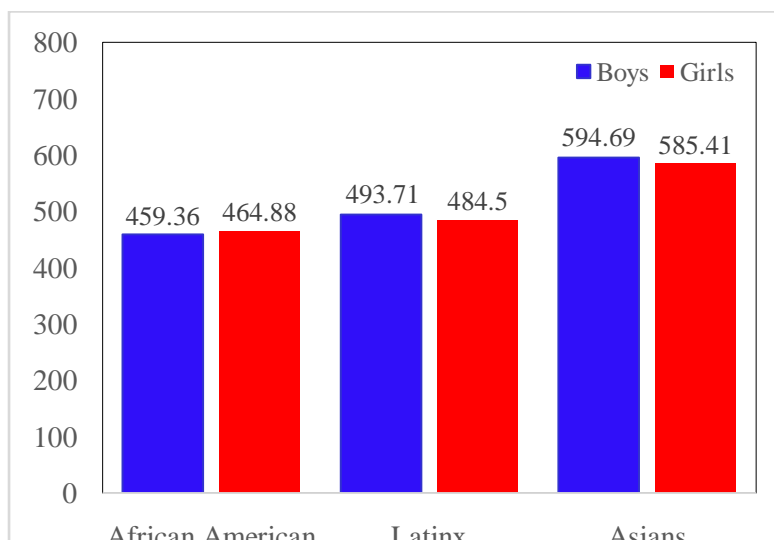Figure 7. eighthgrade content domain (2) Geometry by ethnicity and gender

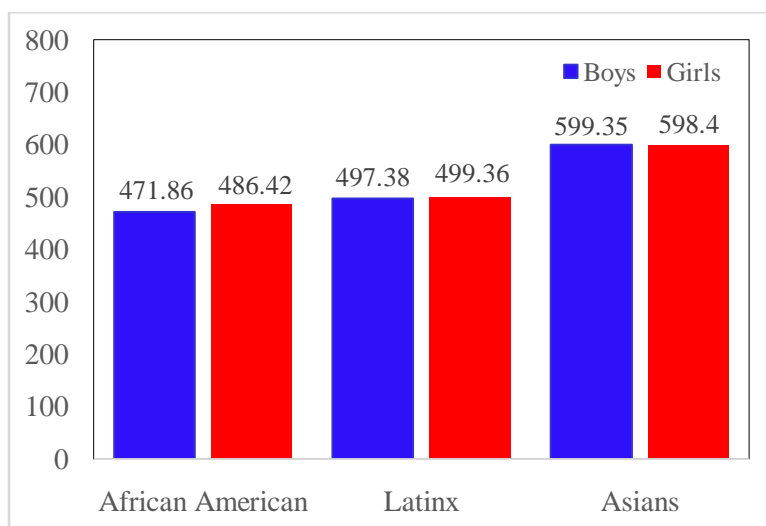Figure 8. eighthgrade content domain (3) Data & Chance by ethnicity and gender

Figure 9. eighthgrade content domain (4) Algebra by ethnicity and gender

V. CONCLUSION

This studyanalyzed the fourth and eighth grade mathematics achievement by gender, ethnicity, and content domains. Similar trends were identified across every content domain in both grade 4 and 8. Asian students scored higher, followed by Latinx and African American. The results aligned with the previous research studies that Asian students tend to score higher than other ethnic groups [3] [6].

When it comes to gender difference, the mean scores of African American, Latinx, and Asian boys were higher than their counterparts across all domains on the fourth grade tests. On eighth grade assessment, African American girls scored higher than African American boys on Geometry, Data &Chance, and Algebra, while Asian boys reported higher mean score than Asian girls across all domains. In the case of Latinx, boys had the higher scores than Latinx girls on Number, Geometry, and Data & Chance. Latinx girls reported a higher mean score than Latinx boys on Algebra. In other words, the males had an advantage on the fourth grade tests, but the pattern was changed on the eighth grade tests. These results were similar to the results of the 2019's Nation's Report Card [24]. On the 2019 National Assessment of Educational Progress (NAEP) mathematics tests, fourth grade boys outperformed girls, but on the eighth grade mathematics tests, girls reported the same mean score as the boys.

On the other hand, the results of the present study were contrary to some previous research studies [10] [25][26]. Cimpian and colleagues' study [10] that found a gender gap favoring boys on the Early Childhood Longitudinal Study- Kindergarten (ECLS-K) data. Other studies that used TIMSS data in Turkey and in Malaysia also reported that girls outperformed boys [25] [26]. They found that there existed a gender achievement gap in mathematics in favor of girls in the early grades that widened as the grade level increased. Therefore, continued research studies are needed to support the generalization to other assessments and educational settings.

Furthermore, the fourth grade students across all groups except Asian boys scored higher on Number, followed by Data Display, and Geometric Shapes &Measures. The Asian boy group also reported the highest mean score on Number, but they performed better on Geometric Shapes & Measures than on Data Display. In terms of eighth graders' achievement by content domains, all groups reported the highest scores on Algebra and the lowest scores on Geometry. However, the second and third highest domains were different across groups. African American girls, Asian girls, and Asian boys reported their second highest domain was Data & Chance, followed by Number, while African American boys, Latinx girls, and Latinx boys performed better on Number than on Data & Chance. With a similar academic inquiry, Fox [27] explored the Texas Assessment of Knowledge and Skills (TAKS) data by ethnicity and objectives. In Fox's study, fourth grade African American, Latinx, and Asian students scored the highest on Numbers, Operations, and Quantitative Reasoning, and they performed better on Geometry and Spatial Reasoning than on Data Display, which was a comparable section to the content domain, Data & Chance on TIMSS.

This study revealed that there was inequality in the U.S. educational system. While this study examined TIMSS 2015 mathematics assessments, the same achievement trend favoring Asian students was observed. In addition, a pattern of negative performance by African American students was evident across all content domains. In terms of gender achievement gap, fourth grade boys scored higher than their counterparts across ethnicity, but a changed achievement trend was observed on the eighth grade assessment. African American girls scored higher than African American boys on mathematics test overall, and on the Geometry, Data & Chance, and Algebra. Latinx girls reported a higher mean score than Latinx boys on Algebra on the eighth grade tests.

Based on the results of this study, several recommendations are suggested. It is important that all students should experience academic success in education [1] [28]. The results in this study identified that African American and Latinx students did not perform as well as Asian students did. This result demonstrates that there may exist different educational opportunities across ethnicity. The policy makers, school administrators, and teachers in the U.S. should create a culturally responsive environment and consider how to implement culturally responsive teaching which emphasizes different cultural characteristics, experiences, and perspectives of ethnically diverse students as conduits for teaching students more effectively [29] [30].Moreover, each group of students' achievement levels vary depending on content domains. Only few previous studies about academic achievement considered gender, ethnicity, and content domains simultaneously. To provide accurate information about students' achievement, future research is needed to explore these elements.

REFERENCES

[1]   Larke, P. J., Webb-Hasan, G., Jimarez, T., and Li, Y. Analysis of Texas achievement data for elementary African American and Latino females. Journal of Case Studies in Education, 6, 2014, 1-16.

[2]   Anderson, S., Medrich, E., and Fewler, D. Which achievement gap? Phi Delta Kappan, 88(7), 2015, 547-550.

[3]   Valencia, R. R. *Students of color and the achievement gap: Systemic challenges, systemic transformations*. (Oxfordshire; Routledge, 2015).

[4]   McKinsey & Company. The economic impact of the academic achievement gap in America's schools, 2009, 1-24.

[5]   Paik, S. J., and Walberg, H. J. *Narrowing the achievement gap: Strategies for educating Latinx, Black, and Asian students.* (NY: Springer Science & Business Media, 2007)

[6] Bergin, C. C. and Bergin, D. A. *Child and adolescent development in your classroom*. (Stamford, CT: Cengage Learning, 2015).

[7] Gándara, P. The Latinx education crisis. *Educational Leadership, 67(5),* 2010, 24-30.

[8] Cvencek, D., Kapur, M., and Meltzoff, A. N. Math achievement, stereotypes, and math self-concepts among elementary-school students in Singapore. *Learning and Instruction, 39,* 2015, 1-10.

[9] Cheryan, S., Master, A., and Meltzoff, A. Cultural stereotypes as gatekeepers: Increasing girls' interest in male-dominated STEM fields by diversifying stereotypes. *Frontiers in Psychology, 6(49),* 2015, 1-8.

[10] Cimpian, J. R., Lubienski, S. T., Timmer, J. D., Makowski, M. B., and Miller, E. K. Have gender gaps in math closed? Achievement, teacher perceptions, and learning behaviors across two ECLS-K cohorts. *AERA Open, 2(4),* 2016.

[11] Robinson, J. P., and Lubienski, S. T. The development of gender achievement gaps in mathematics and reading during elementary and middle school: Examining direct cognitive assessments and teacher ratings. *American Educational Research Journal, 48(2),* 2011, 268-302.

[12] Reardon S. F., Fahle, E. M., Kalogrides, D., Podolsky, A., and Zárate, R. C. Gender achievement gaps in U.S. school districts. *American Educational Research Journal*, 2019, 1-35.

[13] Evans-Winters, V. E., and Esposito, J. Other people's daughters: Critical race feminism and black girls' education. *Educational Foundations, 24,* 2010, 11-24.

[14] Duke, D. L. Can within-Race achievement comparisons help narrow between-Race achievement gaps? *Journal of Education for Students Placed at Risk (JESPAR), 22(2),* 2017, 100-115.

[15] Bohrnstedt, G., Kitmitto, S., Ogut, B., Sherman, D., & Chan, D. *School Composition and the Black-White Achievement Gap*. NCES 2015-018. (D.C.; National Center for Education Statistics, 2015).

[16] Paschall, K. W., Gershoff, E. T., and Kuhfeld, M. A two decade examination of historical race/ethnicity disparities in academic achievement by poverty status. *Journal of Youth and Adolescence, 47(6),* 2018, 1164-1177.

[17] Gándara,P. The potential and promise of Latinx students. *American Educator, 41(1),* 2017, 4-11.

[18] Hemphill, F. C., and Vanneman, A. *Achievement gaps: How Hispanic and White students in public schools perform in mathematics and reading on the National Assessment of Educational Progress*. (DC; National Center for Education Statistics, 2011).

[19] Yoon, A. J., and Merry, J. J. Understanding the role of schools in the Asian-white gap: a seasonal comparison approach. *Race Ethnicity and Education, 21(5),* 2018, 680-700.

[20] Pomerantz, E. M., Altermatt, E. R., and Saxon, J. L. Making the grade but feeling distressed: Gender differences in academic performance and internal distress. *Journal of Educational Psychology, 94(2),* 2002, 396-404.

[21] Alexander, E. *Teacher evaluation: The relationship between performance evaluation ratings and student achievement,* doctoral diss., Liberty University, VA, 2016.

[22] Leahey, E., and Guo, G. Gender differences in mathematical trajectories. *Social Forces, 80(2),* 2001, 713-732.

[23] Mullis, I. V. S., and Martin, M. *TIMSS 2015 assessment framework*. (MA; TIMSS & PIRLS International Study Center, 2013).

[24] Department of Education. *2019 mathematics and reading assessments*. (DC; National Assessment of Educational Progress, 2020).

[25] Bursal, M., Buldur, S., and Dede, Y. Science and Mathematics Course Success of Elementary Students in Low Socio-Economic Status among 4th-8th Grades: Gender Perspective. *Education & Science / EgitimveBilim, 40(179),* 2015, 133-145.

[26] Saw, G. K. Patterns and trends in achievement gaps in Malaysian Secondary Schools (1999–2011): gender, ethnicity, and socioeconomic status. *Educational Research for Policy and Practice, 15(1),* 2016, 41-54.

[27] Fox, B. L. *A critical examination of Texas mathematics achievement in grades three through eight by mathematical objective across race/ethnicity, gender, and socioeconomic status,* doctoral diss., Texas A&M University, TX, 2011.

[28] Ladson-Billings, G. But that's just good teaching! The case for culturally relevant pedagogy. *Theory into Practice, 34(3),* 1995, 159-165.

[29] Gay, G. *Culturally responsive teaching: Theory, research, and practice*. (Amsterdam Avenue, NY: Teachers College Press, 2010).

[30] Larke, P. Culturally Responsive Teaching in Higher Education: What Professors Need to Know. *Counterpoints, 391,* 2013, 38-50