Closing the STEM Achievement Gap from a Unified Global Perspective

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Introduction

Closing the achievement gap has become a focal point of education reform efforts and many nations have made it their mission to close the gap. Efforts to combat the gap have been numerous but fragmented, and have ranged from affirmative action and multicultural education to finance equalization, improving teacher quality and school testing and accountability programs to create equal educational opportunities.

The Achievement Gap is defined in many ways. In the U.S it is defined as the observed disparity on a number of educational measures in academic performance between different groups of students, especially groups defined by race/ethnicity, gender, and socioeconomic status. Other countries use some of these terms, such as socio-economic status, ethnicity and gender, but they also include geography, race, class and caste in defining the achievement gap in their country. The achievement gap can be observed on a variety of measures, including standardized test scores, grade point average, dropout rates, and college-enrollment and –college-completion rates.

In the U.S., *achievement gap* is typically used to describe the disparity in test scores between minorities, usually between Blacks and Hispanics and their White (and Asian) peers, and between high-poverty students and their more wealthy counterparts. At each grade level, racial disparities on an array of achievement variables demonstrate a wide gap in performance, especially in mathematics and science, particularly among disadvantaged minorities from urban and rural communities. These disparities start as early as kindergarten, persisting across grades, and in most cases widen over time. Although standardized tests are the standard measurements for the achievement gap used in the United States a variety of measures, including standardized test scores, grade point average, dropout rates, and college-enrollment and-completion rates are used in other countries.

The United States uses the National Assessment of Education Progress (NAEP, the Nation's Report Card) to assess the performance of students in grades 4, 8, and 12. It ranks student performance according to three achievement levels: (1) **basic**—student has partial mastery of prerequisite knowledge and skills that are fundamental for proficient at each grade; (2) **proficient** –student demonstrates solid academic performance for each grade level assessed; (3) **advanced**—student demonstrates

superior performance. Many countries use the evaluation results of the Program for International Student Assessment (PISA). Most countries participating in PISA are members of the Organisation for Economic Co-operation and Development (OECD), although the number of participating non-OECD nations and regions is increasing. Most OECD countries are economically advanced nations (NSB, 2012).

Data from NAEP indicate that Blacks and Hispanics made strides in closing the gap until the mid-1980s, at which point those gains began to level off. For example, in the 2009 NAEP results, the gap between Black and Hispanic fourth-grade students and their White counterparts in mathematics was more than 20 points.In eighth-grade mathematics, the gap was more than 26 points.

Various gaps exist between groups all over the globe. A recent book by Clark (2014) provides a rich tapestry on the achievement gap in science, technology, engineering, and mathematics (STEM) in selected countries around the world (Australia, Brazil, Canada, China, UK, Korea, Mexico, Singapore, South Africa, Turkey, and the U.S), These countries were selected because of their uniqueness and the work they are doing in their educational school system to change a practice that will help all students, especially poor, low-income students and students of color to succeed. The school systems are also diverse. Each country offers us something to learn. Many countries, especially Asian countries, have developed and implemented unique models to meet the demands of today's learners. For example, in Singapore, the education system is flexible and caters to every child's abilities, interests, and aptitudes so as to help each develop to his fullest potential. It focuses on the development of human resources to meet Singapore's need for an educated and skilled workforce. It also facilitates the inclusion of social moral values to serve as cultural ballast in the face of rapid progress and change.

The countries in the study have all implemented unique system models to meet the demands of their students. Some of the models include structural, administrative, curriculum changes that government/policy makers have suggested or enforced. Some Countries have built strong education systems creating productive teaching and learning systems by expanding access while investing purposefully in ambitious. There is no single way in closing the achievement gap.

The Achievement Gap in the United States

The achievement gap in the United States refers to the disparity in academic performance, as shown by standardized test scores, between groups of students, mainly minorities: Blacks (African Americans), Hispanics (Latinos), Native Americans (American Indians), and their White (and Asian) peers. The gap is usually defined based on students' performance in elementary and secondary school in the subject areas of mathematics, science and reading. At each grade level, racial disparities on an

array of achievement variables demonstrate a wide gap in performance, especially in mathematics and science, particularly among disadvantaged minorities from urban and rural communities. These disparities start as early as kindergarten, persisting across the secondary grades, and in most cases widen over time.

The achievement performance also differs by family income. At each grade level, in both mathematics and science, students from low-income families have lower average scores and are less likely than students from wealthy families to reach the proficient level. These gaps related to family income are substantial. For example, students from low-income families are at least three times less likely to score at or above the proficient level for their grade in both mathematics and science (NSB, 2006). Low income is measured by whether or not a student is eligible for the free or reduced-priced school lunch program.

Raising academic achievement levels for all students is a top priority for education reform at all levels across the United States. Although improvements have been made, gaps among students of different demographic backgrounds and among schools with different student populations have been a persistent challenge in K–12 education in the United States.

Data from National Assessment of Education Progress (NAEP) indicate that Blacks and Hispanics have shown improvement since 1990, but the 2011 NAEP data show that White and Asian/Pacific Islander students continue to outperform students at every grade level (NAEP, 2011). In both mathematics and science, most 4^{th-}, 8^{th-} and 12^{th-} grade students did not demonstrate proficiency in the knowledge and skills taught at their grade level. Racial/ethnic minority students and students from poor families and disadvantaged backgrounds lagged behind their more advantaged peers, with these disparities starting as early as kindergarten, persisting across grades, and, for some kinds of skills, widening over time (NSB, 2006). Despite the improved performance overall, achievement gaps between these various groups persist and have shown no signs of narrowing since 1990. Black, Hispanic and Native American students in mathematics and science are performing at lower levels than are White and Asian students. In 2011, White students scored higher on average than all other racial/ethnic groups in science. Asian/Pacific Islander and Native Americans/Alaska Native students scored higher on average than Black and Hispanic students, and Hispanic students scored higher than Black students (U.S. Department of Education National Center for Education Statistics, [NCES], 2011). Boys performed slightly better than girls in both subjects.

Overall, large majorities of 4^{th-}, 8^{th-}, and 12th-grade students did not demonstrate proficiency in the knowledge and skills taught at their grade level.

Though a majority of 9th grade students reached proficiency in low-level algebra skills, few mastered higher level skills. Results of international mathematics and science literacy tests show that 15-year-olds continue to lag behind their peers in many countries, even though their scores have improved in recent years (NSB, 2012).

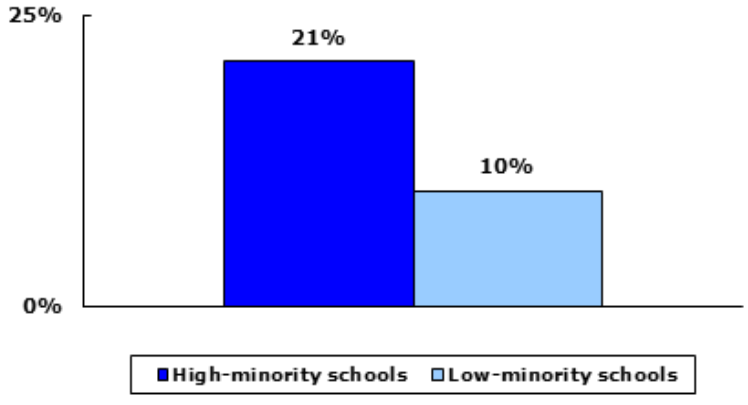
What causes the achievement Gap? The factors are numerous, but some of the strongest factors include poverty, early childhood learning, teacher quality, and strength of the curriculum. There are differences in what happens in schools that are associated with differences in student achievement, including high standards with rigorous curriculum, and qualified and experienced teachers.

Clark (2014) believes the key factors contributing to the achievement gap can be summed up in two words: equity and access. Overall, minority students have less access to: (1) well-qualified science and mathematics teachers, (2) strong science and mathematics curriculum, (3) resources, (4) classroom opportunities, and (5) information.

Less Access to Well-Qualified Science and Mathematics Teachers

Teacher quality can contribute to the achievement gap. Good teaching matters more than anything else, but Blacks and other minority students get less than their fair share of qualified teachers. Minority students get more inexperienced teachers-teachers with three or fewer years of experience. As shown on the table listed below, inexperienced teachers are twice as likely to be in schools with a high level of minority enrollment than in schools with a low level.

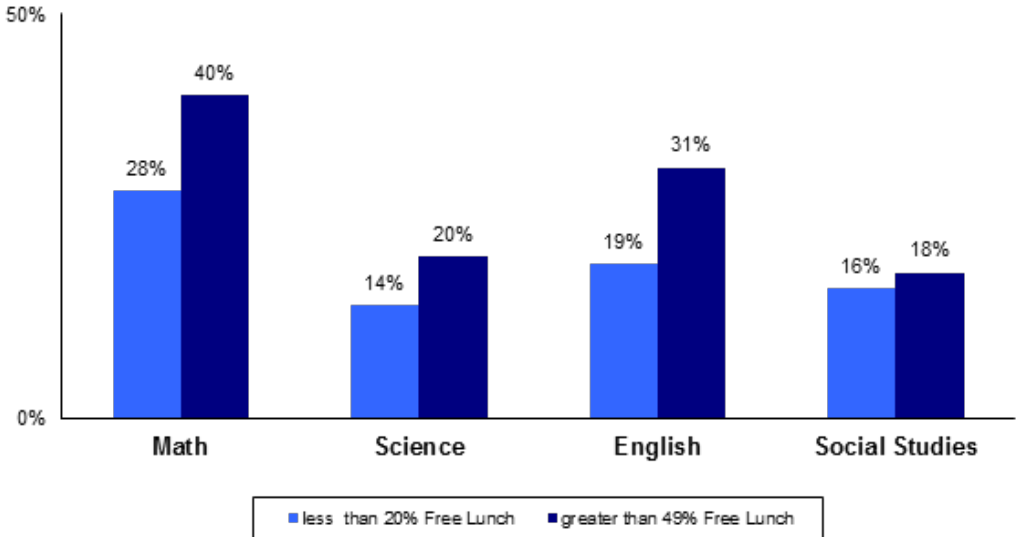
Minority students get more inexperienced* teachers



Teacher with 3 or fewer years of experience. "High" and "low" refer to top and bottom quantities.

Source: *National Center for Education Statistics, "An Indicators Report," December 2000.*

More classes in high-poverty schools are taught by the least-qualified teach

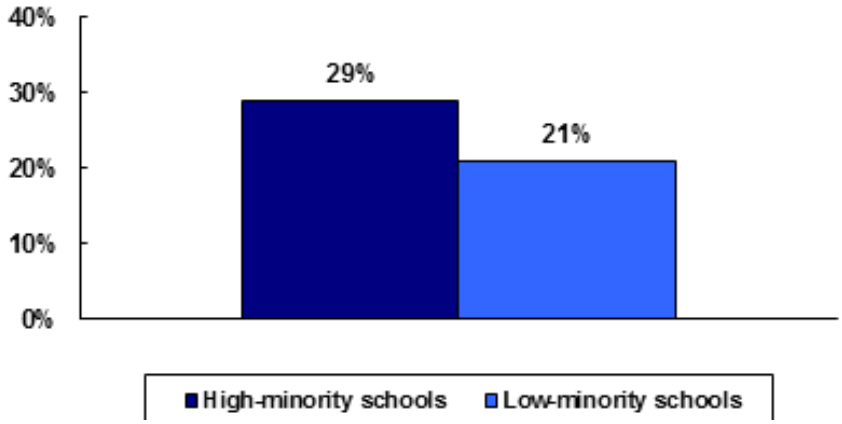


Teachers who lack a major or minor in the field

Source: *National Commission on Teaching and America's Future, What Matters Most: Teaching for America's Future (p.16) 1996*

The least-qualified teachers are often assigned to teach minority students. More classes in high-minority schools than in low-minority schools are taught by out-of-field teachers-teachers lacking a college major or minor in the field. High-minority schools contain 50 percent more minority students. Low-minority schools contain 15 percent or fewer minority students.

More classes in high-minority schools are taught by out-of-field teachers*



Teachers lacking a college major or minor in the field.
Source: *Education Trust (2003).*

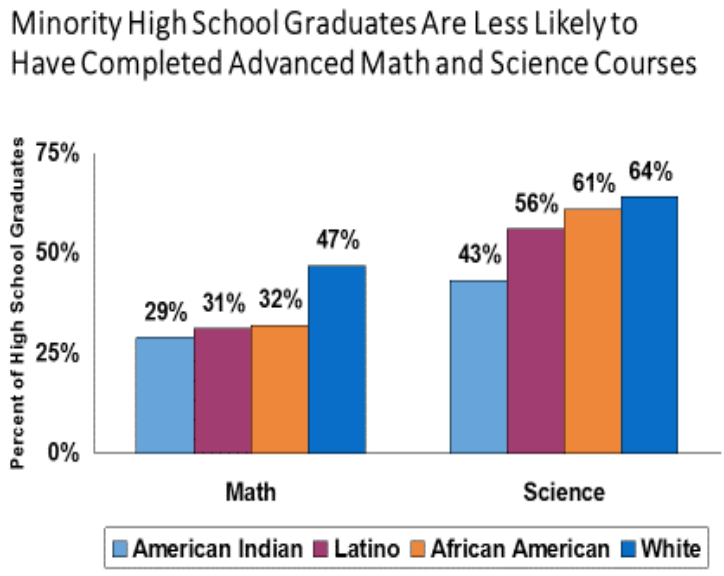
Further, teachers and principals in low-income, high-minority, inner city schools all report problems with teacher interest, motivation, preparation, and competence in science and mathematics instruction. These problems are more evident at the secondary level, where "nearly all types of secondary schools tend to place their least qualified teachers with low-ability classes and their most qualified teachers with high ability classes."

Less Access to a Rigorous High-Level Curriculum

Research shows that students' academic achievement is closely related to the rigor of the curriculum. Poor and minority students have less access to high-level curriculum. Minority students consistently achieve and participate less in mathematics and science and have less access to mathematics and science and high-level curriculum. They experience less extensive and less demanding courses and programs. They are less likely to have completed advanced science and mathematics courses.

Differences exist in science and mathematics taking across racial groups. For example, fewer African American students are enrolled in Algebra II. Whereas 62 percent of white and 70 percent of Asian students had taken Algebra II in 1998, only 52 percent of African Americans, 48 percent of Hispanics, and 47 percent of American Indians had taken this course.

Minority high school graduates are also less likely to have completed advanced mathematics and science courses, and they are less likely to be enrolled in a full college prep track.



Source: U.S. Department of Education, NCES, *Condition of Education 2004*, p 148. Data from 2000 NAEP High School Transcript Study.

Less Access to Resources

Research shows that school districts where low-income, high-minority students are educated consistently receive less state and local money to educate them than do the districts serving the smallest number of minority students. They received approximately $614 less per student per year in 2003 (Education Trust, 2006). Students in low-income, high-minority schools appear to have less access to computers and computer staff, science laboratories, and related resources.

They also lack access to science classes and rigorous science curriculum. Inequities of technology access exist in America's schools. School access, however, does not always mean classroom access, and a digital divide between rich and poor schools still exists. Schools with high minority enrollment have less access to the Internet than do schools with low minority enrollment.

Access to technology is more of a given for white students than for minority students. Data from the U.S. Department of Education, National Center for Education Statistics (NCES, 2000) revealed that Internet access in classrooms varies according to school characteristics. For example, in 1999, 39 percent of instructional rooms had Internet access in schools with a high percentage of low-income students or high concentrations of poverty compared with 62 to 74 percent in schools with low concentrations of poverty.

Less Access to Classroom Opportunities

Teachers of low-income and minority students place less emphasis on essential curriculum goals such as developing inquiry and problem-solving skills. In low-ability tracks, almost all goals are less emphasized, expectations are lower, and instruction is less engaging. There are inequities in school funding. Students from non-white ethnic groups, with the exception of Asian Americans, appear more likely to attend a disadvantaged school, in terms of affluence and resources.

The disadvantaged schools are more likely to have low teacher morale, deteriorating school facilities, fewer materials, lower quality or nonexistent laboratory opportunities, lower student motivation, and fewer certified teachers--especially for science. Nationwide, only about 65 percent of eighth-grade teachers report adequate facilities for laboratory science (NSB, 1996). Performance on the 1996 NAEP in science was higher for students from well-equipped classrooms.

Less Access to Information

School characteristics (such as courses offered and teacher education and experience), student characteristics (such as family income), and mathematics and science course taking all correlated with academic achievement (U.S. ED/NCES 2000c). In addition, national, state, and school district policies regarding teacher qualifications and curricula vary, resulting in differences in access to high-quality teachers and higher-level mathematics and science courses. Low-income, rural and minority parents have less access to information regarding educational opportunities for their children. In summary, factors that contribute to the achievement gap in mathematics and science include inequity in access to qualified teachers, facilities, resources, challenging science, and mathematics curricula for minority students, and too few students taking advantage of advanced coursework.

In the United States different schools have different effects on similar students. Children of color, especially Black and Hispanic students, tend to be concentrated in low-achieving, highly-segregated schools. These minority students are more likely to come from low-income households, meaning that minority students are more likely to attend poorly funded schools based on the districting patterns within the school system.

Schools in lower-income districts tend to employ less-qualified teachers and tend to have fewer educational resources. Research shows that teacher effectiveness is the most important in-school factor affecting student learning (Darling Hammond, 2000, 2014; Akiba, 2014).

In an effort to improve the quality of mathematics and science in U.S. schools and to make mathematics and science accessible to all students, major national reform initiatives have been designed. The United States has initiated several educational policies and comprehensive reform initiatives, such as No Child Left Behind Act; *America COMPETES Act*, and *Race to the Top* to help close the achievement gap among minority and poor students These initiatives have gained wide distribution and have been implemented by a wide range of U.S. schools, universities, industries and science organizations. These are the No Child Left Behind Act (NCLB), America COMPETES Act, and Race to the Top. The federal government targeted funds directly to low-performing schools through the School Improvement Grants program, for example, to support changes needed in the lowest-achieving schools across the nation. No data are available describing the success of these initiatives in narrowing the achievement gap.

The Achievement Gap in Other Countries

Across the globe, education is essential, bettering the lives of individuals and nations from poverty to affluence. Yet educational opportunity and the upward mobility it can bring have not always been equally available to everyone. In rich and poor nations alike, the disadvantaged--defined by gender and geography, race and religion, class and caste--fall behind, losing the chance to improve their lives and depriving society of the contributions they might have made..

As in the United States many countries have developed and implemented unique education models to meet the demands of their students. Almost every education system has been involved in restructuring. School administrators, teachers, students, and parents have found themselves responding to structural, administrative and curriculum changes that governments say will improve the quality of education, and many of these changes have been documented and discussed. Some school districts have shown that all students--regardless of race, ethnicity, income, and background--can achieve at high levels when provided with the appropriate opportunities. Because

every culture is different, the contours of the problem vary from place to place. The problem is not uniform. The size of the gaps, the severity of the deprivation, and the identity of the disadvantaged vary from culture to culture.

Everywhere, however, eliminating educational gaps is a complicated endeavor that demands concerted effort from politicians, bureaucrats, teachers, university administrators, and policy makers.

Achievement Gap in Korea

The achievement gap is being addressed in various ways in many countries. High achieving countries-Korea, Singapore, and England have centralized systems of teacher education and certification with tighter regulatory control by the central government. Many countries around the world, like Australia, have centralized teacher hiring and distribution policies.

In Korea inequities in achievement is due to economic disparity and gender inequities. In regard to STEM education, in comparison to students in other countries, Korean students routinely outperform students on mathematics and science standardized examinations In addition, fewer than 6% of Korea's students fail to complete high school and more than 70% of students go on to enroll in two- or four-year university of vocational programs upon completing high school. With regard to access to elementary and secondary education opportunities, there are few discernable differences in either school attendance or academic achievement in terms of gender. However, fewer girls pursue tertiary education than boys and the gender disparity is even greater in graduate and doctoral programs than in undergraduate studies, so fewer women than men are entering the STEM workforce in Korea. National assessments do suggest a developing "gap" in achievement between students in different social class levels and between students living in different regions of the country. Researchers attribute differences in educational advancement between boys and girls to historical gender inequities and differences in achievement is attributed to economic disparities in different regions of the country (e.g., rural versus urban/suburban areas) and between the social classes. Economically disadvantaged families (especially those who tend to live in rural areas) cannot afford private tutoring fees (or access tutors), so these students are not as competitive on the annual national college entrance exam. These gender and class inequalities have their roots in socio-historical, political traditions, which have helped to shape Korea's education system over the last 500 years. In addition to these issues, Korea is facing new challenges with regards to educating an increasingly culturally, ethnically, and linguistically diverse student population resulting from the development of new immigration policies seeking to create an international workforce. (Martin, et al, 2014).

Achievement Gap in Singapore

Many countries, especially Asian countries, have developed and implemented unique models to meet the demands of today's learners. For example, in Singapore the education system is flexible and caters to every child's abilities, interests, and aptitudes so as to help each develop to his fullest potential. It focuses on the development of human resources to meet Singapore's need for an educated and skilled workforce. It also facilitates the inclusion of social moral values to serve as cultural ballast in the face of rapid progress and change. In Singapore, there are disparities in educational outcomes between students of differing demographic characteristics, such as ethnicity and socio-economic status.

In Singapore, there are disparities in educational outcomes between students of differing demographic characteristics, such as ethnicity and socio-economic status. The achievement gap in Singapore is defined largely in terms of ethnicity especially the ethnic Malay minority's persistent educational gaps vis-à-vis the ethnic Chinese majority and socio-economic class. However, official data are often scant, especially in the case of socio-economic gaps. The little data that are available for STEM achievement are based on ethnicity and highlight Malay students falling behind in mathematics and science at the primary level and in mathematics at the secondary level. This is despite the existence over the past three decades of various state-supported Malay community initiatives such as private tutoring schemes to boost overall Malay educational achievement. No evidence is provided about the effectiveness of these initiatives in reducing the achievement gaps. (TAN, 2014).

Achievement Gap in England

There have been various achievement gaps in England over the years – differences in school attainment by students from different socio-economic classes, different genders and different ethnic groups. The achievement gap in England is primarily defined in terms of socioeconomic status. There is a considerable and persistent gap in England in the rates of participation in higher education between those from higher and lower socio-economic groups. The gap is often expressed as the difference between those who are eligible from Free School Meals and the rest of the student population. There are also gender and ethnicity achievement gaps but the political emphasis in England is on closing the socioeconomic status achievement gap. The STEM attainment gap during compulsory education appears driven by similar factors to the general attainment gap, however there seems to have been less progress. More concerning is the gap in the proportions who continue studying STEM subjects in post-compulsory education, particularly between males and females.

There has been more progress in closing the overall socioeconomic status achievement

gap in the period between 1997 and 2010, using a diverse range of strategies. Many of these have run counter to the general thrust of increased market competition to drive school improvement.

Although Basil Bernstein, a leading English sociologist of education, argued years ago that "education cannot compensate for society", policy makers continue to believe that education and other social policies can help to equalize school performance and life chances between different social groups. (Whitney, 2014).

Achievement Gap in Turkey

Ensuring students' access to qualified teachers is an important goal of educational policy and reform in many countries. There is a lack of highly qualified teachers, especially in mathematics and science and other STEM fields; low social status and salary of teachers and their poor working conditions (as in Turkey); a lack of systemic induction programs; and inequitable distribution of qualified teachers between high-poverty and low-poverty schools. Many countries show major gaps in students' access to qualified teachers between wealthy and high-poverty students, and White and ethnic minority students. High poverty students and ethnic minority students are twice as likely as wealthy and White students to be assigned novice teachers. They are also more likely to be taught by uncertified teachers, as in Africa and the United States.

In Turkish context, achievement gaps refers to differences of students' mathematics or science achievement depending on educational factors (e.g., school types or students' socioeconomic backgrounds), especially in the national context. These achievement gaps or differences can be observed on individual, group, school, and/or regional levels. In general, Turkey has a large achievement gap-contributed to four major challenges which are all connected: quality differences in school types, competitive nationwide examinations, standardized and teacher-centered science and mathematics teaching from elementary school through college, and the effects of socioeconomic background differences on science and mathematics. There is a need to explore relationship patterns between these challenges.

In Turkey, the number of high school types is very high. While elementary school types are at expected levels (public and private schools) there are more than twenty types of secondary schools. In addition to this school type variability, there are big STEM gaps, in particularly mathematics and science achievement gaps, between these schools. This challenge seems to be the biggest factor widening mathematics and science achievement gap in Turkey. As a solution to narrow differences between high schools, Ministry of National Education (MONE) has started to decrease the number of school types at high school levels.

In 2010, 350 general high schools were converted into Anatolian high schools, and by the end of 2013, all general high schools are going to be Anatolian high schools. In the near future, MONE is planning to convert Anatolian teacher high schools into Anatolian high schools. In the long run, the aim of MONE is to collect similar high schools under one umbrella and to narrow science and mathematics achievement gaps between high schools. (Topeu, 2014).

Achievement Gap in Australia

In Australia the achievement gap is identified in relation to socioeconomic status, Indigeneity and geographical location with students in rural and remote schools generally achieving lower results than their peers attending city schools. Importantly, these three components interact with rural locations having a higher population of Indigenous students and populations with lower SES compared to many affluent suburbs in cities. These achievement gaps have been considered in government policy for educational planning in the past, however access to international data sets like PISA have provided the hard evidence around the extent of this achievement gap. While Australian students compare favorably to most other western countries regarding their scientific literacy, gaps emerge in relation to Indigenous and low SES students. For example, PISA 2009 highlighted that Indigenous students achieved mean score that was 81 points below the Australian mean score whereas students from low socioeconomic backgrounds attained a mean score 96 points below the Australian mean. Unfortunately, these gaps are substantive equating to between 2-2.5 years of schooling with an equivalent gap identifiable for PISA 2009 mathematics.

Attempts to close gaps in Aaustralia has small beginnings of success. For example:

- Emphasis on quality teaching for all students with a focus on dealing with diversity within the classroom.
- Targeted programs for students from Indigenous and low SES backgrounds linking them with universities-evidence of traction but still early days.
- Special funding to universities for the inclusion of students from low SES and Indigenous backgrounds.
- Focus on increasing students from these backgrounds into teacher education to provide role models-again, early days but there is evidence of improvement. (Panizzon, 2014)

Achievement Gap in China

Education inequality exists everywhere, and China is no exception. However, the achievement gap in China takes entirely different forms and has different causes than that

in the United States. Achievement gap in China is not primarily an ethnic one. Over 90% of China's population is ethnically Han. The achievement gap in China is geographical, economical, and political. China's achievement gap is influenced by economic facto. For example, education in Western China is generally of lower quality than that in more developed eastern provinces of China. Children in rural areas are much more likely than those in the cities to drop out of school and to have fewer opportunities to attend college. The national hukou system, a way to manage population based on their place of birth, has been another powerful cause of the gap.

In China, achievement has been narrowly defined as the Gaokaao scores. The unequal educational opportunities are marked between urban and rural areas, between the Eastern and the Central/Western regions, and between more and less prosperous provincial areas. In contrast with the United States, where race/ethnicity is the primary concern for the achievement gap, ethnicity is a much smaller factor in China. Instead, both the general achievement gap and STEM gap in China are influenced by economic favors. But more important, both gaps are the product of social, political and historical factors such as the Hukou requirement, the quota system, and policies of school choices.

China has intentionally created an educational system that deliberately celebrates achievement gaps based on meritocracy. China has undertaken numerous efforts to address the inequalities in education, out of national economic and political concerns. (Zhang and Zhao, 2014).

Achievement Gap in South Africa

Reforms are underway in South Africa to deal with the achievement gap between advantaged and disadvantaged students. Poor communities, in particular those of rural Africans, bear the brunt of its past inequalities. South Africa's focus is on Apartheid that created racial discrimination/segregation, fiscal inequality. At the height of the apartheid era, public spending on white children was around 5 times the amount for Africans. South Africa has participated in seven cross-country comparative studies and the results were South Africa performed poorly compared to many of its more impoverished neighbors, and very poorly in relation to developing countries in other parts of the world. Poorer children receive schooling inferior to that of their more affluent peers. There are continuing large disparities in the outcomes produced by different kinds of school linked to past racial affiliation. (Taylor and Muller, 2014).

Achievement Gap in Mexico

There is an inequality gap of the great cultural and socio-economically diversity of the Mexican population, characterized for the large differences among those more or less marginalized, with a very high percentage of population in poverty and a high percentage

in extreme poverty. There is concern on the achievement of students in rural, urban of high marginalization, and urban of low marginalization. By addressing this concern, it is hopeful that improvement toward closing the gap will occur. (Sanchez Martinez, 2014).

Achievement Gap in Canada

Socioeconomic status in high-poverty communities is an issue Canadians having been dealing with in closing the gap. A concern of Canada public education is that of achievement differences in national, provincial/territorial, or group performance. In Canada there is an inter-provincial, gender, and indigenous status gaps. The critical issue for Canada has been the engagement and performance of indigenous students (male and female). Canada has used international, national, and provincial (BC) test, participation, and graduation data to identify gaps across nations, provinces, schools, gender, and ethnicity (indigenous/non-indigenous). The nation and province difference are apparent but not super interesting. The gender difference of the past have closed to where females perform as well or better than males, except their participation in mathematical sciences in post-secondary level remains less than males. This is critical for the STEM pipeline issues. Attention is given to language arts, science, and mathematics. Technology and engineering are not a central part of the school curriculum in most provinces. To assist in closing the achievement gap, post-secondary institutions in BC participate in a program that provides scientist, engineers, technologists, and mathematicians as speakers for schools. The University of Victoria and other university have offered informal or extra-curricular in summer camps, after school, and Saturday programs on STEM to encourage and interest girls and boys in these disciplines and future careers. Similar events and internships have been offered during the Pacific CRYSTAL and other projects to allow young indigenous people to learn their IKW and transition to WMS. These projects have real potential, but they are small in number and recent arrival in STEM education platform. Clearly, the New Framework for Science Education K-12 (NRC, 2012) recognizes that science and engineering practices will provide a justification for more in and out of school opportunities like these for indigenous and non-indigenous girls and boys. (Yore, 2014).

Achievement Gap in Brazil

In Brazil, the achievement gap focuses on the prevalence of socio-economic differentials between Black and White Brazilians. There is the persistence of gaps in the quality of education provided to Blacks and Whites. In Brazil, test scores in the southeast top those in the northeast.In the United States graduate from high school at far lower rates than their White and Asian peers.

Around the world, in countries rich and poor, some groups succeed educationally – attending school, earning high grades and test scores, completing college degrees –

whereas others struggle, for a complex mix of historical, cultural and economic reasons. (Rangel & Madeiria, 2014)

Summary

Research conducted around the world shows inequity to qualified teachers, facilities, resources, challenging mathematics and science curricula, and opportunities; and too few students enrolled in advanced coursework all contribute to the achievement gap in mathematics and science. School characteristics such as family income and mathematics and science course taking are all correlates of academic achievement. In addition, policies regarding teacher qualifications and curriculum vary from country-to-country, resulting in differences in access to high-quality teachers and higher-level mathematics and science courses. For example, high achieving countries-Korea, Singapore, and England, have centralized systems of teacher education and certification, with tighter regulatory control by the central government. Singapore and Korea have built strong education systems creating productive teaching and learning systems by expanding access while investing purposefully in ambitious educational goals using strategic approaches to build teaching capacity. Some countries, like Canada, have raised their test scores and high graduation rates in Canadian schools by providing more resources.

Australia is focusing on ways to improve the socioeconomic status in relation to the achievement of secondary science and mathematics students. Australia is also looking at ways to ensure that schools are empowered in a sustainable way Many countries like Australia also have centralized teacher hiring and distribution policies. Turkey is also looking at quality differences in school types and teacher effectiveness. Poverty and unequal resources and unequal distribution of curriculum and teachers are serious in some of the countries such as Mexico, the United States, and Brazil. Low-income children are much less likely to have access to early learning opportunities than their more affluent peers. These inequalities translate into disparities in the number of qualities and other educators, and to unequal access to high quality curriculum. Teachers in high need schools have an average lower levels.

England describes how they narrow the socio-economic achievement gap in England under its New Labor Government in an effort to equalizing school performance. Turkey has recently science and mathematics reforms built on the Ministry of National Education (MONE) student-centered and flexible learning and teaching methods instead of standardized teaching. Brazil is exploring unique ways of eliminating racial disparities in socio-economic outcomes in Brazil. Reforms are underway in South Africa to deal with the achievement gap between advantaged and disadvantaged students. Poor communities, in particular those of rural Africans, bear the brunt of its past inequalities. Government has embarked on a strategy in the interests of improving quality in poorly

performing majority schools, strengthening school supervision, holding schools accountable for the performance of their learners, and strengthening initial teacher training.

In the United States, there are two achievement gaps in its education systems. The first of these – well-documented, widely discussed, and the focus of education reform efforts for the past decades or longer - is the gap between the quality of schooling that most middle class children (wealthy) gets in America and the quality of schooling available for most minority and poor children – and the consequent disparity results. The second one is the global achievement gap – the gap between what even our best suburban, urban, and rural public schools are teaching and testing versus what all students will need to succeed as learners, workers, and citizens in today's global knowledge economy. There is also a large gap in STEM education in the United States compared to many countries. Achievement in the United States since its founding has been concentrated in just a few places, which has created a gap that correlates with economic and educational disparities observed today.

The commonality that exists in the achievement in most of the countries is socioeconomic status. A very important concern is the level of education and inequitable distribution of support to schools in low income and minority communities. Low-income children are much less likely to have access to STEM and other learning opportunities than their more affluent peers. Economics is a critical determinant to access. To improve student achievement and opportunities demands access and equity

Concluding Remarks

Across the globe, in both rich and poor nations, education is essential and it is the key to developing the intellectual capacity of our children. Nothing is more vital to our country's future than ensuring that all students receive a quality education. Gains in student achievement can most likely be realized wherever along the development continuum the effort is made.

The success of education in this century and the century to come will depend on the extent to which we educate all of our children and the achievement gap is closed so that No Child is Left Behind..

The level of education and inequitable distribution of support to schools in low income and minority communities is a very important concern in many of the countries Economics is a critical determinant to access. To improve student achievement and opportunities demands access and equity. Education provides the basis for infrastructure development, adequate sustenance, health care, healthy and sustainable environments, civic and social order and growth, and productive civil order and growth, and productive civil and international relations.

Several countries have shown that access and equity are compelling factors in closing the achievement gap. Providing all students (rich and poor, male and female, Black, Hispanic, Native Americans, Indegenous, and other ethnic groups) with well-prepared and qualified teachers, adequate funding and resources, rigorous mathematics and science curriculum, opportunities with high expectations, will go a long way to promoting excellence and in closing the achievement gap.

Data from the various countries suggest several conclusions. First, they confirm that socioeconomic status is a strong and consistent determinant of academic achievement in all countries and contribute to the achievement gap. The issues of access, equality and equity are important concerns in education reform and become salient political concerns. In practice, however, in many countries, the children who most need an extra educational boost are the least likely to get it. Lower-quality schooling appears to help perpetuate inequality rather than combating it.

The time is ripe for a concerted effort to improvement the achievement of all of our students. By focusing our attention on closing the achievement gap, with immediate attention to STEM, we will be able to give local, State, and Federal educational agencies a call for action that is substantive, timely, and sufficiently targeted that it is reasonable to anticipate progress.

We live in an era in the history of nations when there is a greater need than ever for coordinated political action and responsibility. Collaboration between the various countries, learning from each other, and sharing with each, can serve to elevate an international dialogue on the critical issues associated with the achievement gap and provide concrete examples to foster a solution. New ideas coming from other countries, and having other countries understand and learn from each other, can help in transforming education and in the closing of the achievement gap.

It is the hope that the findings and analysis and the overall issues of the achievement gap will benefit not only the further development of each region but also other international communities. Perhaps most importantly, all the countries will keep the goal of closing the achievement gap and raising the achievement performance of all the children in STEM at the forefront of their attention. In this way, we would be working together to solve a problem of global significance.

Disclaimer:

The views of this manuscript are those of the author and not those of the National Science Foundation (NSF)

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