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Closing the STEM Achievement Gap from a Unified Global Perspective

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Abstract[1]

One of the most troubling problems facing education in schools today is the achievement gap-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 Across the globe, in both rich and poor countries, a wide achievement gap among various groups of students is common, and has become a focal point of education reform efforts. These countries struggle with educational and social-mobility gaps that divide members of disadvantaged groups from their more privileged peers. Research conducted on achievement gap around the world (Australia, Brazil, Canada, China, UK, Korea, Mexico, Singapore, South Africa, Turkey, and the U.S (Clark, 2014), shows inequity in access to qualified teachers, facilities, resources, challenging mathematics and science curricula, and opportunities, all contribute to the achievement gap in STEM. Unique education models to meet the demands of their students have been developed and implemented. Research shows how qualitative, quantitative and students' data correlated with classroom practices, teacher instruction, and academic programming, as part of efforts toward measuring growth.

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 –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. Although standardized tests are the standard measurements for the achievement gap used in the U.S. 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 U.S. uses the National Assessment of Education Progress (NAEP) 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 PISA.

Various gaps exist between groups all over the globe. A recent published book written by Clark (2014) provides a rich tapestry on the achievement gap in science, technology, engineering, and mathematics (STEM) (Clark, 2014) 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

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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 this 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.

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. 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. Many countries like Australia, 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 like Mexico, US, 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.

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. 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.

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. Yet across the globe, both rich and poor nations struggle with stubborn educational and social-mobility gaps that divide members of disadvantaged groups from their more privileged peers. 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. Achievement levels that seem troublingly low in Canada look exceedingly high in Mexico.

The achievement gap in China is geographical, economical, and political. China's achievement gap is influenced by economic factors. China also illustrates the difficulties brought about size. Also, China has a huge span of levels of wealth. Information about this country can help us gain a better understanding of how the dimensions of size and wealth can influence the ability of a country to educate its people. Furthermore, China, like many countries in the Asian-Pacific region, seems to out-perform those that we usually hear about. Singapore, Korea, and Australia perform at levels similar to the European countries that are noted for their high quality of education. In places such as the U.S and the UK, Asian students generally outperform those from other ethnic backgrounds. We might discover reasons for this high level of performance that would have a message for countries that do not perform as well.

Some countries (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.

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.
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 to continue enhancing the opportunities for their students.
Because every culture is different, the contours of the problem vary from place to place; what counts as failure in one country may look enviable somewhere else. Everywhere, however, eliminating educational gaps is a complicated endeavor that demands concerted effort from politicians, bureaucrats, parents, teachers, university administrators, and policy makers.
The U.S. has initiated several educational policies and 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.
Education systems around the world have recognized the need for schools to change the way in which they go about their task. Many systems are moving from a quality education system for a few students to having a quality education system for most students. The challenge now is to move from having a quality education system for most students to have a quality education system for all students.
The near-universally of educational gap masks profound global diversity. Each society defines its disadvantaged groups differently – by geography, gender, race, ethnicity, class, religion or language. From country to country, the size of the gap between advantaged and disadvantaged groups varies greatly. 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.

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,, 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.
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.

Various countries have provided information on reform initiatives, policy implementation for closing the gap. The issues of access, equality and equity in education reform become salient political concerns. 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.
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 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. 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.

References

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