

## **Girls Academic Performance in Science Subjects: Evidences from the Industrializing and Least Industrialized Countries**

Raza Ullah<sup>\*</sup>, Hazir Ullah<sup>\*\*</sup> and Akhlaq Ahmad<sup>\*\*\*</sup>

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### **Abstract**

The study reviewed the published empirical evidence on girls' academic performance in science subjects in Industrializing and Least Industrialized Countries. Empirical evidences suggest that girls have been outperforming boys in education across the globe. Policy makers and academics have extensively studied this gender reverse change in the context of technologically advanced countries. The issue is an emerging phenomena in the context of industrializing and least industrialized countries and has received some academic attention in the last two decades. This gender reversal change in academic performance is an interesting trend in the context of industrializing and least industrialized countries. Nevertheless, girls as compared to boys, are not doing well in science subjects: technology, engineering and math (STEM). This review paper seeks to give a succinct picture of gender differences in academic performance in STEM subjects in the socio-cultural contexts industrializing and least industrialized. The findings of our umbrella review of different studies in the developing countries show girls' underperformance in STEM subjects in the industrializing and least industrialized countries. Findings (skimmed from a number of empirical studies) suggest boys' outperformance in STEM subjects.

**Keywords:** Educational performance, Gender reverse change, Outperformance, STEM

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<sup>\*</sup> PhD in Sociology, International Islamic University, Islamabad. E-mail: razaullahkhan01@gmail.com

<sup>\*\*</sup> Associate Professor Department of Sociology and Director ORIC, Quaid-I-Azam University, Islamabad.

Email: hazirullah@qau.edu.pk

<sup>\*\*\*</sup> Assistant Professor, Department of Sociology, International Islamic University, Islamabad.

Email: akhlaq.ahmad@iiu.edu.pk

## Introduction

Gender gap in educational performance, favoring girls, have been observed throughout the globe (Ullah, 2020; Bailur, 2006; Ullah et al., 2020; Ullah & Ullah, 2019). A large body of literature is available on the issue in different social settings (Machin & Pekkarinen, 2008; Ullah et al., 2020; Ullah & Ullah, 2019). There are studies which show that boys are showing good results in STEM subjects (Ullah, R, 2020; Driessen & Van Langen, 2013). The similar finding has been given by Sinnes (2006). He argued that boys are showing good performance in STEM education. Similarly, the performance of boys is not satisfactory in Arts subjects (Ullah, R, 2020; Goldin et al., 2006b). The underrepresentation and underperformance of girls in science subjects (math and engineering) and of boys in humanities is a universal issue (Burke & Mattis, 2007; Ceci et al., 2009; Ceci & Williams, 2011). Some researchers and academics have pointed out and reported that this gap in industrialized countries are very low (Ullah, R, 2020; Kindlon, 2007). However, this is not the case in industrializing and least industrialized countries. There was huge gap in STEM subjects was, favoring boys, have been lessened (Andresen et al., 2008; Baru, 2012). For examples, results of various tests a schools level in STEM subjects confirmed gender parity in the educational performance of boys and girls (Thomson et al., 2012). Albeit some studies revealed girls' outstanding performance in STEM subject, but they are still lagging behind boys in STEM subject in many sittings in in developing countries (Adler et al., 1992; Asante, 2010; Jayachandran, 2015). Several studies reveal that boys achieve higher grades than girls in subjects of science and math (Hedges & Nowell, 1995; Randhawa, 1994). The overall findings from many studies suggest the academic performance of boys and girls in science and math subjects is a complex and plastic phenomena that exist with diverse and varied findings. Findings from several studies in the context of developing countries is presented here to shed light on girls' performance in STEM subject in the developing world.

## Research Methodology

The results of this review paper is based on the core findings of empirical studies carried out in different industrializing and least industrialized countries on girls' academic performance in STEM subjects. Thus, this paper does not have conventional methodology-methodology adopted for collecting primary data but draws on empirical findings from several studies to substantiate the existing argument regarding girls' academic underperformers in STEM subjects. Nevertheless, a systematic approach and criteria for including different studies were adopted for generating relevant findings. Studies on the differential performance in developing countries were included in review. We kept studying empirical studies till reaching the point of saturation in our findings. The umbrella findings from the reviews of empirical studies suggest girls' underperformance in STEM subjects in the context of developing countries. The skimmed findings from various empirical studies are presented in the forthcoming results and discussion section.

## **Results and Discussion**

This article skims and presents empirical studies on girls' academic underperformance in STEM subject. A brief account of the findings and discussion of the skimmed studies, presented to support the argument.

### **Girls' performance in STEM subjects**

Empirical findings in different settings show gender gap in STEM subjects in industrializing countries (Riddell et al., 1991). They mentioned that girls are not showing good results in STEM in global south (Ullah, 2020). Sifuna,(2006) and Wambua (2007) unanimously stated that boys' and girls' performance are different in different settings. To give a more holistic and vivid picture in different settings of the developing countries, we turned this discussion to studies on boys' and girls' performance across different courses.

In Kenya, the overall performance is not satisfactory in STEM education (Ullah, 2020; Musau et al., 2013; Ullah et al., 2020). The findings of the aforementioned cited studies are: girls' performance in STEM and boys' performance in Arts is very poor. Similar findings are also depicted by Agesa and Agesa (2000) and Changeiywo (2000). They unanimously asserted that there is differential performance across different subjects at all levels of education. For example, Musau et al (2013) argued that girls' academic performance in STEM subject is shaky. Sifuna (2006) and Wambua (2007) mentioned that male students are outdoing girls in STEM particularly at middle and secondary level. Catherine (2011) asserted that boys have outscored girls in all key examinations in STEM subjects.

In the context of Tanzania, girls remain behind in STEM education at school and college level. For instance, findings show that boys outstripping girls in STEM in in school and college level's tests. This gap is increasing with the passage of time (Ullah, 2020). Ullah (2020) also mentioned that girls' performance is worst in rural and traditional areas. This is also discussed and debated by Kabote et al., (2014). For instance, they assert that the performance gap supporting boys is not only prevailing at school but also observed in higher education. They have summed up their study by claiming that in recent years this gap has increased.

In Zambia, there are evidences that approve differential performance in different subjects. It should be noted that although very little work has done on this issue. Though, the problem of girls' shaky performance is not of the recent emergence and found in all educational levels (Sayers, 1994). Ullah (2020) has mentioned that girls performance is not up to the level particularly in STEM education not only at primary and middle but also in secondary and higher secondary levels. He also found that this performance is worst especially in higher education. On the basis of his findings, it is therefore, said the

performance gap for boys is much higher at all levels of education in Zambian context. He also mentioned that girls' grades and results is very low in STEM education. He summed up his study with a firm assertion over all girls are under dog in STEM education. Thus, we may argue here that in Zambia, STEM education is deemed a boys' terrain (Ullah, 2020).

The similar picture of boys and girls academic performance has depicted In Zimbabwe as well (Ullah, 2020). He mentioned in his study that the performance of girls in STEM education is not good and need attention. Grades of girl students are low and this falls each year almost at all levels of education (Riddell et al., 1991). Nevertheless, girls' grades drop quickly when they jump to higher education.

As far as girls' performance in STEM subject is concerned in Malawi context, findings do not go in their favor. For example, in a very old study, Walter (1997) told that the grades of girls are very low particularly in STEM education. He also stated that girls' performance is someway good in literature and other social science subjects but their grades are very bad in STEM fields. Some small scale studies show that very little girls had shown good performance only in cities and urban settings (Kalipeni, 1997). He added that in capital city even some girls performance is good than boys in STEM fields. Nonetheless, small villages, girls overall performance is not good and need considerable attentions of the academicians. (Chamdimba, 2003). Drawing on his study, it is therefore argued that girls in rural areas do not get helpful and friendly environment for science subjects and that's the main reasons of their poor performance and low grades in such settings. The findings discussed in Malawi setting, show that Malawi is still a gendered society and both boys and girls have different choices and interests. This gendered culture impeding girls to get STEM education.

Similarly, as far as educational institutions are concerned in Mozambique, having gendered performance (Ullah, 2020). He mentioned in his study that girls are showing poor performance in STEM. The similar findings has depicted by Jha et al., (2012). They mentioned that the grades and results of girl students for each year remain very low. They went to the extent and argued that the grades are very poor for girls especially in rural and small villages. They summarized their study by claiming that as far as enrollment is concerned, girls are very low in number in STEM education. Based on this, it is therefore, stated that in Mozambique, girls face problems in their way of getting STEM education. Those who have access to get STEM education, having no friendly and equal opportunities like boys in schools and colleges. Thus, in a nutshell, it is mentioned that culture and environment do not support girls in STEM education.

Studies show that the performance of girls in STEM education is very poor in Namibia (see Ullah, 2020). He also mentioned that boys' performance is not satisfactory in Arts and literature. Thus, male students leading girls in arts and girls leading them in STEM fields (Mwetulundila, 2000). He also told that in Namibia arts is considered appropriate for female students and STEM is deemed suitable for male students that lead to gendered performance. The study carried out by Dickerson et al., (2015) reveal that in last six years the gendered performance has lessened where female students have achieved good grades at primary and middle levels however, no such change has observed in higher education . In a conclusion, it is stated that the performance of girls is very low in STEM fields not only at middle levels but almost in all educational levels.

In a nutshell, it is therefore concluded that in industrializing and least industrializing countries boys and girls have different choices and interests that affect their educational attainments and achievements. For instance, in such countries, boys underperform in arts and humanities subjects because they have been constructed by family and culture that you are only for science subjects (Ullah, 2020). They don't take interest in these subjects. Girls fail in science subjects as these subjects are considered masculine subjects. On the other side, in industrialized countries, as we see no differences between masculinity and femininity and thus both boys and girls have similar choices and interest that in turn lead to their sound academic performance in different fields. Thus, it could said that socio-cultural context and environment are affecting girls and boys performance in education (Ullah et al., 2020; Ullah & Ullah, 2019).

## **Conclusion and discussion**

This review paper synthesized previous studies on girls' academic performance in science subjects in a wide range of industrializing and least industrialized countries. Studies have consistently highlighted girls' underperformance in science subjects across the developing world, including Pakistan. Many of the included studies have attributed girls' academic underperformance in science subjects to gendered and patriarchal culture in industrializing and least industrialized countries, especially in their rural settings. These studies across societies unanimously conclude that girls' academic performance did not improve in STEM subjects like it had improved in arts and humanities.

## **Recommendations**

Girls' performance in STEM subjects can be improved if they (girls) are given conducive environment to study STEM subjects. In short, to address this issue, the following measures need to be taken.

1. Girls can outperform boys in STEM fields, if they are given environment and opportunities which is available to boys.

2. Parents should change their traditional mindset that girls cannot perform well in science.
3. Female students lack facilities and labs in schools. Government should provide facilities and opportunities to girls like boys.

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