Measuring Literacy Gap in the World for Economic and Social Development: Evidence from Selected Countries and the Lessons Learned

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Abstract: Literacy rate is a major indicator of economic and social development, the campaign for growth and improvement in this area by several international organizations have caused significant growth in all major regions of the world. The persistent theme to these various programs is that illiteracy is nonetheless prevalent in the world and more study needed to eradicate it, thus generates a significant interest in this issue. Therefore, the primary goal of this current study is to compare five major regions in the world as classified by the World Bank in regards to the differences which exist in literacy. The study concludes that literacy rates of male and female across the regions are different for Youth literacy between the age of 15 and 24. The vast conclusion is that that there is a no significant difference in male literacy among the regions in the world except for Africa. While no significant difference in female literacy among the regions in the world.

Keywords: *Literacy rate, economic and social development, gender, World Bank, and MANOVA*

1. Introduction

Literacy is a major world development indicator, major projects and campaigns are being put in place daily to combat youth and adult illiteracy in different countries, and regions. Roser and Ortiz-Ospina (2018) stated "literacy is a key skill and a key measure of a population's education and despite improvements in literacy in the second half of the 20th century however, there is still a wide disparity between nations". Rao and Sweetman (2014) suggested that about sixty-one percent about 120 million adult illiteracy across the world are women and it has been the main emphasis for international organizations and development community. While the Adult literacy index is often used to measure the number of adults who are capable of reading and writing in given states. Literacy rate deploys indicator of economic and social development, the campaign for growth and improvement in this area by several international organizations have caused significant growth in all major regions of the world. However, there is evidence that literacy gaps still exist among these regions as seen in Figure 1a and 1b.

Figure 1a: Literacy Rate
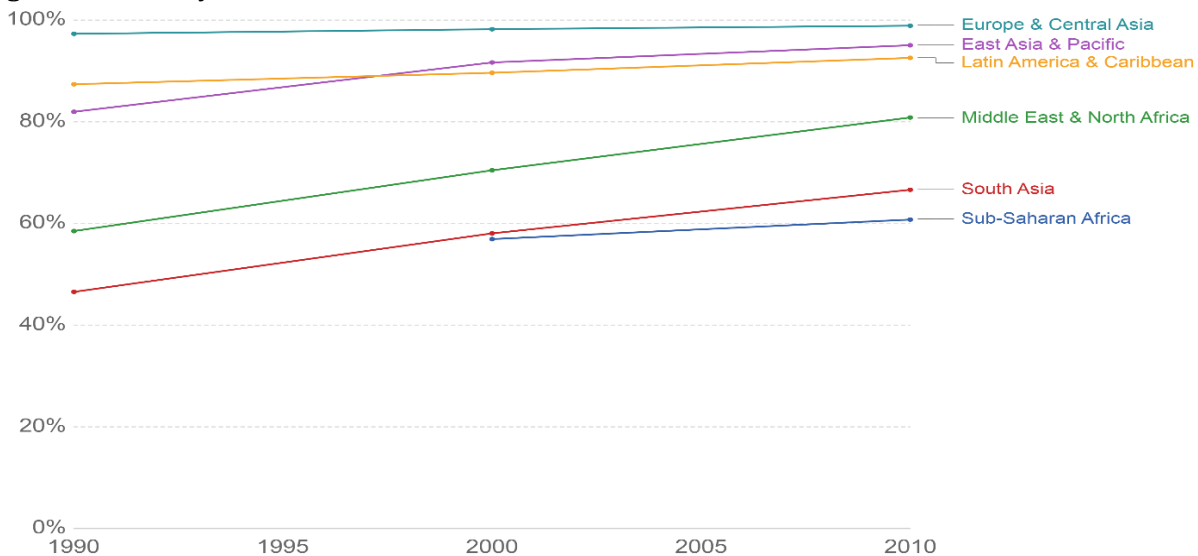

Source: unesdoc.unesco.org

Figure 1b: Youth Literacy Rates
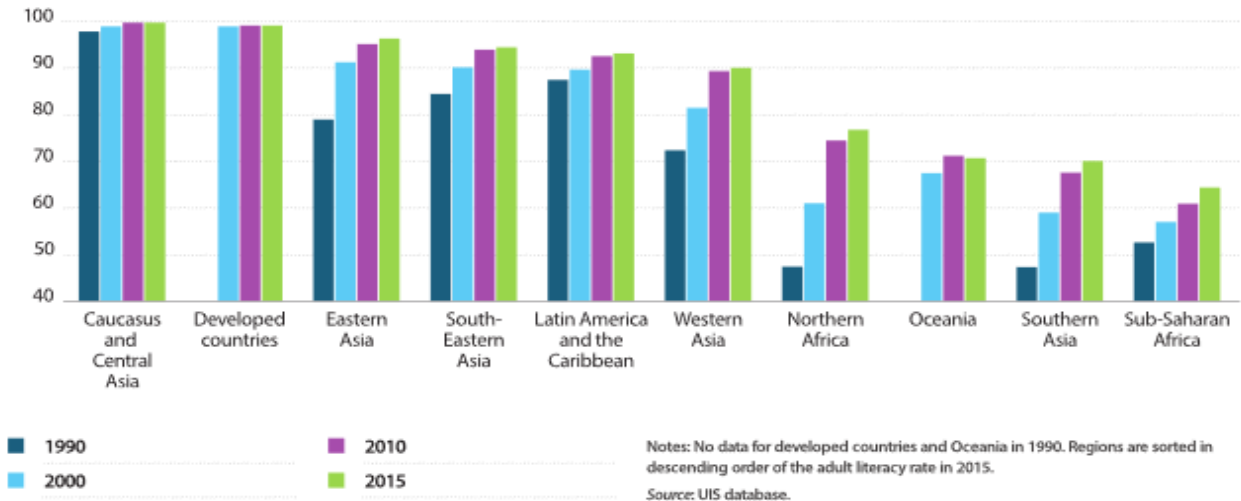
Source: unesdoc.unesco.org

Furthermore, several studies conducted have suggested that most governments neglect and are often not concerned with the increasing illiteracy among their populations especially with adult literacy. The pattern is evident between 1999 through 2015 where the number of literate people in the world has declined from 4.0 to 3.7 billion (Blunch, 2017). Kim (2018) observed discrepancies in literacy gaps within the framework of the United Nations Sustainable Development Goals. The results found significant intergenerational literacy gaps and several trends of literacy gaps across nations. These gaps are even more alarming when placed in the context of a global population. Within the same period, this number has jumped from six billion to roughly seven billion. The number of children studying today is a third lower than the same number in the 20th century. Women are less literate than men; a third of women in the world are illiterate and have never been to school, and only less than half have attended a secondary school. Among the latest projects and campaigns is the Adolescent Girls Initiative in Afghanistan, Emergency Youth Employment and Skills Development Project in sub-Sahara Africa, School Sector Reform Program in Nepal, to name a few amongst hundreds. The persistent theme to these various programs is that illiteracy is notwithstanding prevalent in the world and more study is still needed to eradicate it, thus our interest in this issue. Perhaps one of the major setbacks combating youth illiteracy is the discrimination that exists in educational opportunities based on a gender bias that is the focus of our study; to look at the differences in literacy rate between males and females (Olaniyan, 2008). As of 2015, the statistics indicate that the illiteracy rate between 2005-2015, Africa has the highest illiteracy rate of 35.7%, while 30.1% for South Asia, 20% in Latin American and 20% for Middle East.

Figure 2: The Illiteracy Rate of Among Adults Over 15-Year-Olds from 2005-2015 by World Regions
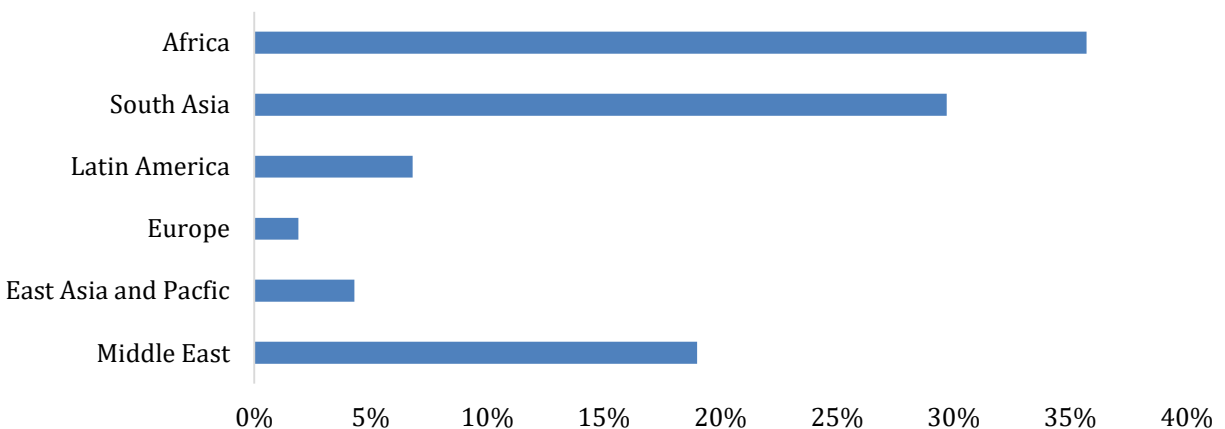
Therefore, the primary goal of this current study is to compare five major regions in the world as classified by the World Bank in regards to the differences which exist in literacy. Hence, this current research study would attempt to provide responses to these research questions: Is youth literacy rate as a fraction of between the age of 15 and 24 that are capable of comprehending, reading and writing for their everyday living is significant? Is there a significant gender difference in youth literacy among the world regions? Is there a significant difference in youth literacy among the world regions?

2. Research Design

By definition, the youth literacy rate is "the proportion of people between the age of 15 and 24 that are capable of comprehending, reading and writing for their everyday living. (The World Bank www Worldbank.org/projects), Similarly, Organization for Economic Co-operation and Development (OECD) in 2013 assessment data construct literacy as a multidimensional skill to be learned and measured." Therefore, the primary goal is to compare the literacy rate of males and females among five major regions in the world as classified by the World Bank. To study this variation, this research conducts a multivariate analysis of variance. Cleophas and Zwinderman (2018) noted that is the general technique for analyzing multivariate data but are restricted in the scope of variables that were included and owing to the weakness of associations among variables decreasing the statistical power of the test. In addition, complete statistics are missing and MANOVA of male literacy and female literacy (Yokozeki 1999). This research subscribed to MANOVA because we measure two IV's and by measuring two DVs rather than one, we believe we can improve the chance of figuring out how the regions different relative in literacy. MANOVA may also reveal differences not detected by separate MANOVAs. In this analysis, a multivariate F-value was used because the two measures are associated when carrying out the significance test. The following research hypotheses for the multivariate study are:

(1) H_0: There is no significant difference in literacy rate among the five regions in the world.
H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$

(2) H_0: There is no significant gender difference in youth literacy among the five world regions.
H_0: $\mu_1 = \mu_2$

(3) H_0: There is no significant interdependence between factors Country and Gender. All the main differences between treatment conditions are explained by the main effects of the two factors.

The subjects for the analysis are 50 countries randomly selected from five regions of the world. A sample of 10 countries from each region randomly selected for the analysis. The data source is The World Bank; yearly data in which countries are ranked countries based on progress in different areas including education. The dependent variable for the analysis is the youth literacy rate, for females and males (% of females and males 15-24 age), one of the world development indicator data (www Worldbank.org/projects).

3. Technical Report

The distributional form of the data is illustrated in Figure 3. The boxplots illustrate wider spread than what has been claimed by the different organizations that have been involved in the study and discussion in Literacy in the world. Greatest difference between males and females among the five regions is seen mainly in the Middle East. The boxplots also illustrate the medians for males and females among the five regions that significantly measure out. The study presents a descriptive statistics of the data in Table 1 where the means and standard deviations of the countries for both dependent variables are categorized for the independent variable in the regions. The range is used to show some differences, however, as seen in box plot graph the most difference is evident in the Middle East.

Table 1: Country 1 Dependent Variable: Male Literacy

Country	Mean	Std. Error
Africa 1	81.825	11.572
Middle East 2	92.685	5.836
Europe 3	99.04	1.824
Asia 4	87.867	11.655
Latin America 5	96.298	9.637

Table 2: Country 1 Dependent Variable: Female Literacy

Country	Mean	Std. Error
Africa 1	80.760	15.693
Middle East 2	90.095	12.471
Europe 3	99.180	1.306
Asia 4	86.808	12.454
Latin America 5	96.654	4.763

Multivariate Test: The research computes a multivariate test using Predictive Analytics Software (PASW). The output results show that the multivariate test is significant. Wilks' Lambda for school effect shows a significance value of .001 and $p < .05$. Therefore, there is enough evidence to conclude that literacy rates of male and female across the regions are different i.e. literacy rate of male and female is significantly affected by regions (Table 2).

Figure 3: Male and Female Literacies Comparison
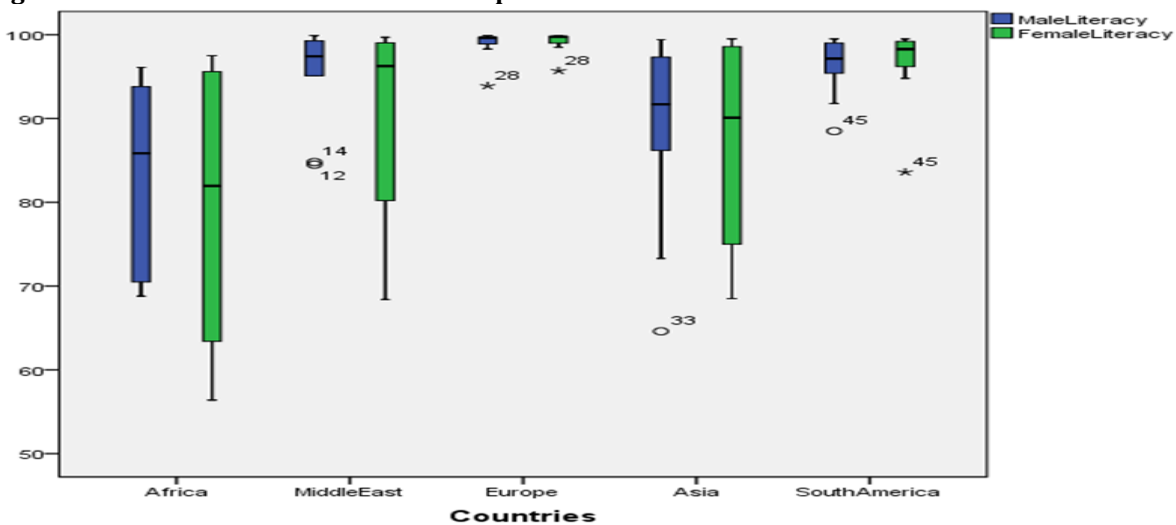
Table 3: Country 1 –Descriptive Statistics for Gender

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Male	92	1	90	95
Female	91	1	88	93

The results of the Multivariate Analysis of variance MANOVAs are presented in Table 3. Bonferroni α correction of .025 is used for each t-test to account of Multiple MANOVA's Country region has statistical significance on both male and female literacy (Hox, & van de Schoot 2018, and Pituch & Stevens 2016).

Country region has a statistically significant effect on both male and female literacy. This study also includes MANOVAs with Tukey's HSD post-hoc tests, as shown in Table 4. The analysis suggests that gender disparity in education is still an issue among some countries in the world today, perhaps much more present in the Middle East than all other regions.

Table 4: Tests of Between-Subjects Effects for Literacy

Source	Type III Sum of Squares	DF	Mean Square	F	Sig.
Corrected Model	3941.497	9	438	4.848	.000
Intercept	838012.38	1	838012.38	9276.4	.000
Country	3761.564	4	940.391	10.410	.000
Gender	79	1	79.123	.876	.352
Country * Gender	101	4	25.202	.279	.891
Error	8130.35	90	90.337		
Total	850084.24	100			
Corrected Total	12071.852	99			

First, for the H_0: There is no significant difference in literacy rate among the five regions in the world.
H_0: $\mu_1=\mu_2=\mu_3=\mu_4=\mu_5$

At 0.05, level of significance this analysis was carried out. The result reveals that the constructed Multivariate Tests- Dependent Variable and there is a significant difference in literacy rate among the five regions in the world. The results on the Multivariate Analysis of variance (MANOVA) for the model are shown in Table 5. The results of Multivariate Tests- Dependent using Wil's Lambda test with (DF = 8, F = 473.48a, P < 0.05), indicated a statistically significant difference in literacy rate among the five regions in the world.

Table 5: Multivariate Tests- Dependent Variable: Countries

Effect		Value	F	Hypothesis DF	Error	Sig.
Intercept	Pillai's Trace	0.9994	3430.59a	2.000	44.000	0.000
	Wil's Lambda	0.006	3430.59a	2.000	44.000	0.000
	Hotelling's Trace	155.936	3430.59a	2.000	44.000	0.000
	Roy's Largest Root	155.936	3430.59a	2.000	44.000	0.000
Countries	Pillai's Trace	0.479	3.48a	8.000	90.000	0.000
	Wil's Lambda	0.561	3.68a	8.000	88.000	0.000
	Hotelling's Trace	0.709	3.81	8.000	86.000	0.000
	Roy's Largest Root	0.585	6.58b	4.000	45.000	0.000

Second, for the H_0: There is no significant gender difference in youth literacy among the five world regions.
H_0: $\mu_1=\mu_2$

For the null hypothesis a 0.05 level of significance, this analysis was carried out using Tests of Between-Subjects Effects- Dependent Variable for Gender and Literacy. The analysis reveals that there is a significant difference in male literacy among the five regions in the world. The results on the MANOVA for the model are shown in Table 6 (DF = 4, F = 6.538, P < 0.05), indicated a statistically significant difference in Male Literacy among the five regions in the world. Also using a 0.05 level of significance this test result shows a significant difference in Female Literacy among the five regions in the world. The results on the MANOVA for the model are shown in Table 6 (DF = 4, F = 4.699, P < 0.05), indicated a statistically significant difference in female literacy among the five regions in the world.

Table 6: Tests of Between-Subjects Effects for Gender and Literacy

Source	Dependent Variable	Types III Sum of Squares	DF	Mean Square	F	Sig.
Corrected Model	Male Literacy	1672.686a	4	418.171	6.538	0.000
	Female Literacy	2189.709b	4	547.427	4.69	0.003
Intercept	Male Literacy	427187.428	1	427187.428	6678.901	0.000
	Female Literacy	410902.88	1	410902.88	3520.657	0.000
Country	Male Literacy	1672.686	4	418.171	6.538	0.000
	Female Literacy	2189.708	4	547.427	4.699	0.003
Error	Male Literacy	2878.2333	45	63.961		
	Female Literacy	5252.039	45	116.712		
Total	Male Literacy	431738.348	50			
	Female Literacy	418344.628	50			
Corrected Total	Male Literacy	4550.919	49			
	Female Literacy	7441.747	49			

Third, H_0: There is no significant interdependence between factors Country and Gender. All the main differences between treatment conditions are explained by the main effects of the two factors

Male Literacy: For the null hypothesis a 0.05 level of significance, this analysis was carried out using Tests of Multiple Comparisons between Gender Literacy and Countries. First, when using male literacy as the dependent variable and Africa as a base country, the result indicates a significant difference in male literacy among five regions expect Asia Table 7. Second, with the Middle East as a base region, the result shows a no significant difference in male literacy among the regions in the world except for Africa Table 7. Third, with Europe as a base region, the result shows a no significant difference in male literacy among the five regions expect for Africa Table 7. Fourth, with Asia as a base region, the result indicates a no significant difference in male literacy among the five regions expect for Africa Table 7. Finally, with Latin America as a base region, the result shows a no significant difference in male literacy among the five regions expect for Africa Table 7.

Table 7: Tests of Multiple Comparisons: Gender Literacy and Countries

Dependent Variable	(I)Country	(J)Country	Mean Difference(I-J)	Std. Error	Sig.
Male Literacy	Africa	Middle East	-12.3850*	3.57661	0.010
		Europe	-16.0100*	3.57661	0.000
		Asia	-6.0340	3.57661	0.451
		Latin America	-13.2830*	3.57661	0.005
	Middle East	Africa	12.3850*	3.57661	0.010
		Europe	-3.6250	3.57661	0.848
		Asia	6.3510	3.57661	0.400
		Latin America	-0.8980	3.57661	0.999
	Europe	Africa	16.0100*	3.57661	0.000
		Middle East	13.2830	3.57661	0.848
		Asia	9.9760	3.57661	0.400
		Latin America	2.7270	3.57661	0.999
	Asia	Africa	6.0340	3.57661	0.452

		Europe	-6.3510	3.57661	0.400
		Middle East	-9.9760	3.57661	0.057
		Europe	-7.2490	3.57661	0.270
	Latin America	Africa	13.2830*	3.57661	0.005
		Middle East	0.8980	3.57661	0.999
		Europe	-2.7270	3.57661	0.940
		Asia	7.2490	3.57661	0.270
Female Literacy	Africa	Middle East	-9.3354	4.8314	0.316
		Europe	-18.4200	4.8314	0.004
		Asia	-6.0486	4.8314	0.721
		Latin America	-15.6636*	4.8314	0.018
	Middle East	Africa	9.3354	4.8314	0.316
		Europe	-9.0846	4.8314	0.342
		Asia	3.2867	4.8314	0.960
		Latin America	-6.3282	4.8314	0.687
	Europe	Africa	18.4200*	4.8314	0.004
		Middle East	9.0846	4.8314	0.342
		Asia	12.2714	4.8314	0.095
		Latin America	2.7564	4.8314	0.979
	Asia	Africa	6.0486	4.8314	0.721
		Europe	-3.2867	4.8314	0.960
		Middle East	-12.2714	4.8314	0.095
		Europe	-9.0846	4.8314	0.287
	Latin America	Africa	15.6636	4.8314	0.018
		Middle East	6.3282	4.8314	0.687
		Europe	-2.7564	4.8314	0.979
		Asia	-9.0846	4.8314	0.287

Female Literacy: For the null hypothesis a 0.05 level of significance, this analysis was carried out using Tests of Multiple Comparisons between Gender Literacy and Countries. First, when using female literacy as the dependent variable and Africa as a base country, the result shows a significant difference in female literacy among the regions in the world except Europe and Latin America Table 7. Second, with the Middle East as a base region, the result indicates a no significant difference in female literacy among the regions in the entire world (Table 7). Third, with Europe as a base region, the results also show a no significant difference in male literacy among the regions in the world except for Africa Table 7. Fourth, with Asia as a base region, the result indicates no significant difference in female literacy among the regions in the world except for Africa Table 7. Finally, with Latin America as a base region, the result shows a no significant difference in female literacy among the regions in the world except for Africa Table 7.

4. Conclusion

This current study suggests that there are countries that are still lagging behind in education. However, the gender gap has significantly reduced across. The findings of the results were examined vis-à-vis the study's research questions. The first research question is to assess youth literacy rate as the fraction people between the age of 15 and 24 that are able to read and write. With regard to this, the findings show the largest difference between males and females among the five regions is seen mainly in the Middle East. Hence, the study concludes that literacy rates of male and female across the regions are different for Youth literacy rate

is the fraction people between the age of 15 and 24. The second research questions identified and test whether there is a significant gender difference in youth literacy among the world regions. As illustrated as above and field observations of their activities, the analysis suggests that gender disparity in education is still an issue among some countries in the world today, perhaps much more present in the Middle East than all other regions. The conclusion is that there is a significant difference specifically in female Literacy among the five regions in the world. The third objective measured differences between factors Country and Gender. All the main differences between treatment conditions are explained by the main effects of the two factors. The overwhelming conclusion is that that there is a no significant difference in male literacy among the regions in the world except for Africa and specifically, there is no significant difference in female literacy among the regions in the world.

References

Blunch, N. (2017). Adult literacy programs in developing countries. IZA World of Labor 2017: 374 doi: 10.15185/izawol.374

Cleophas, T. J. & Zwinderman, A. H. (2018). Multivariate Analysis of Variance and Canonical Regression. In: Regression Analysis in Medical Research. Springer, Cham.

Hox, J. J., Moerbeek, M. & van de Schoot, R. (2018). Multilevel Analysis. New York: Routledge.

Max Roser and Esteban Ortiz-Ospina. (2018). Literacy Published online at our WorldInData.org. Retrieved from: 'https://ourworldindata.org/literacy

Nitya Rao & Caroline Sweetman. (2014). Introduction to Gender and Education, *Gender & Development*, 22(1), 1-12.

Olaniyan, D. A. & Okemakinde, T. (2008). Human Capital Theory: Implication for Education Development" *European Journal of Scientific Research*, 24(2), 157-162.

Organization for Economic Co-operation and Development. (2013a). OECD skills outlook 2013: First results from the survey of adult skills. Paris: OECD.

Pituch, K. A. & Stevens, J. P. (2016). Applied multivariate statistics for the social sciences: Analyses with SAS and IBM's SPSS (6th ed). New York: Routledge.

Suehye Kim. (2018). Literacy skills gaps: A Cross-level analysis on International and Intergenerational Variations, International Review of Education, 64-85.

Yokozeki, Y. (1999). Gender in Education and Development, *Journal of International Cooperation in Education*, 1(1), 45-63.

The UIS Global Education Digests (GED). (2006). The UNESCO EFA Global Monitoring Reports Literacy for Life. The UNDP Human Development Reports.

UNESCO. (2014). Skills for holistic human development. UNESCO Asia-Pacific Education Policy Brief, 2.