Patterns of Roughness in Global Literacy Rates

Halzi D.Dabon, Corazon A.Prejoles, Lelani Cabarrubias-Dapat and Gibson Maglasang*

Abstract

This study examines the literacy rate of 204 countries all over the world focusing on both male and female population with ages 15 years old and above. The source indicates that of all the illiterate adults in the world, two-thirds are women. Data also reveal that extremely low literacy rates are concentrated in three regions: Afghanistan, South Asia, and Sub-Saharan Sahelian Africa, where around one-third of the men and half of all women are illiterate. Using fractal statistical analysis, it was found out that there is a varying pattern or complexity in the literacy rates among the male and female populations of the 204 countries; the fractal dimension of literacy rate of male is higher compared to the female. Based on the findings, it is concluded that since there are several countries with extremely low literacy rates, then the Millennium Development Goal of eradicating illiteracy by 2015 cannot be achieved. The study recommends that the governments should look into the fractality of the other indicators of human development and prosperity of the countries.

Keywords: fractal dimension, spectrum, global literacy rate

1.0 Introduction

The importance of literacy cannot be understated. Literacy makes people knowledgeable and functional in the society. When a society has a literate population, and they develop themselves as well as contribute to their country's progress, that country will have prosperity. In fact, one of the main indicators used in the Human Development Index (HDI) annual global survey is functional literacy (UNDP, 2013). In modern times, literacy is considered not just a privilege but a right accorded to every human being. This study aims to examine global literacy situation with the end-in-view of assessing whether the Millennium Development Goal (2015) of eradicating illiteracy is achievable. Further, the study looks into literacy rate disparities between men and women across the globe.

The Millennium Development Goal (MDG) number 2 aims to achieve universal primary education for all. By 2015, it targets that children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.

It is a fact that literacy is very significant in the lives of the people because it is one of the indicators of the prosperity of a nation. When a county is prosperous, the people inhabiting it are also happy because they could provide for their basic human needs. Through their literacy skills the people would be able to look for ways and means to fend for their needs and survive. Indeed, literacy is basic in the survival of the people. To this end, Arnold et al. (2010) claimed that several underdeveloped nations have very low literacy rates ranging from 60% to 70%. These figures imply that from 30% to 40% of the citizens in these nations can neither read nor write. This deplorable state of affair is reiterated in various studies (Chou,2010), (Santaman's et al., 2008).

*Cebu Normal University

Final results from the 2008 Functional Literacy and Mass Media Survey in the Philippines released in 2012 revealed that almost nine out of 10 Filipinos are functionally literate. In this particular study, 204 countries all over the world were selected from the list of countries provided by Wikipedia source of information regarding the global literacy rate among men and women 15 years old and above. This phenomenon represents fractality because this shows the complexity of the skills between men and women. The figures from the report represent a mixture of data collected by the CIA World Book.

This study on literacy skills of male and female populations in 204 countries in the world aims to achieve the following objectives: 1) to identify the countries with low literacy skills, 2) to distinguish the literacy level between men and women, and 3) to guide countries in setting government policy directions in solving their literacy problem.

2.0 Conceptual Framework

Fractals occur more often in nature than regular shapes. They occur in the patterns of leaves, mountains, Von-Koch snowflake, and Sierpenski carpet. They have the following characteristics: self – similarity, ruggedness and irregularity, and fractional dimension. "Fractal dimension is a ratio providing a statistical index of complexity comparing how detail in a pattern also known as a fractal pattern, changes with the scale at which it is measured (Wikipedia, Fractal Dimension)."

Padua (2013, lecture) states that many phenomena exhibit fractality. The manifestations of fractality are found in income distribution, test scores, conflicts, biology ecosystems, and biological organisms.

He added that for instance in income distribution, there are more people having low incomes than high incomes. Among those with low income, there are more having even lower incomes than higher incomes; same is true for the high income groups. Likewise, in test scores, for instance, there are lower test scores than high test scores. Among those with low test scores, there are more having even lower test scores.

In the area of conflicts, conflicts come in various scales: family level, community level, municipal level, provincial level, regional level, national level, and international level. In essence, the conflict varieties are repeated at each level.

In terms of biology, organisms trace a path that is known to be fractal and generally obeys the fractal dimension of its ecosystem. This observation is very important in landscape ecology. Furthermore, the distribution patterns of biological organisms across various trophic levels are fractal. That is, it is more at the primary producer level than at the top consumer level. The life cycles of organisms (insects to mammals) are also observed to be fractal (Padua, 2013). Overall, fractals occur in nature.

In this particular study on literacy rate among 204 selected countries in the world, literacy rate is a phenomenon considered to be fractal because the men and women ages 15 and above have different genders, different psychological makeup, and different levels of maturity. Through these factors, their literacy rates are also varied. This variety and complexity could exhibit fractality.

The fractality of the data was determined through the use of the histogram. After the data were verified to be fractal, the ranking, alpha, lambda and scale were then computed. The findings were analyzed, conclusion given and recommendations offered in the light of the literacy phenomenon.

3.0 Results

Figures 1-4 show the fractal graphs of literacy rates for men and women in 204 countries.

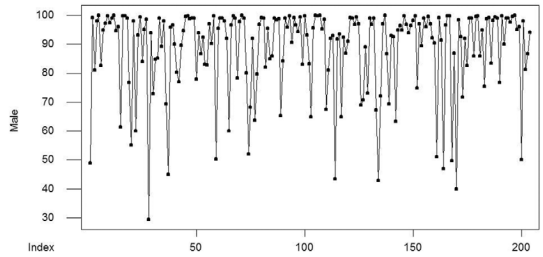

Figure 1: Multiple Fractality of Male Literacy Rates in 204 Countries

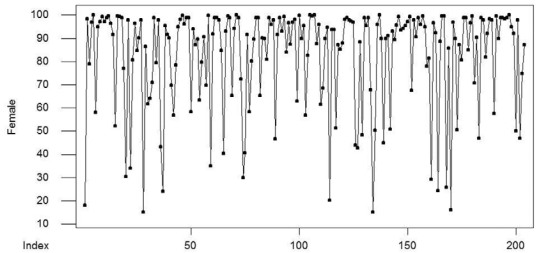

Figure 2 : Multiple Fractality of Female Literacy Rates in 204 Countries

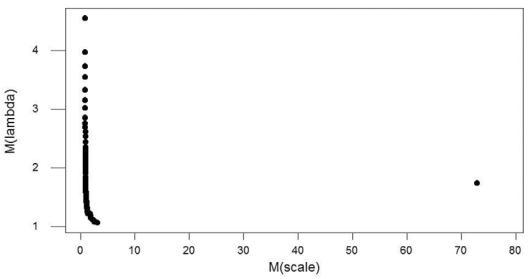

Figure 3: Spectrum of the Male Literacy Rates in 204 Countries

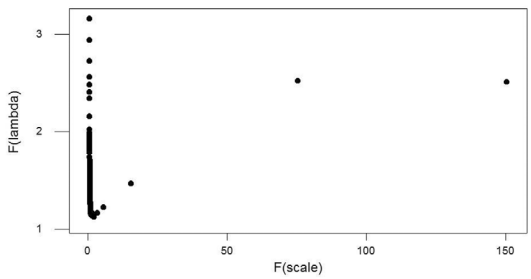

Figure 4: Spectrum of Female Literacy Rates of 204 Countries

4.0 Discussion

Figures 1 and 2 show the inherent roughness and irregularities in the literacy rates for men and women, respectively, across the 204 countries analyzed. In both case, literacy rates vary from a low of 30% to a high of 99% (for men) and from a low of 10% to a high of 99% (for women). Furthermore, the fluctuations in the scores in countries with lower literacy counts are much more pronounced than in those countries with higher literacy. It can be surmised that countries with low literacy rates appear to have varying literacy policies in education. These variations in educational policies regarding basic education cause the more erratic literacy outcomes for these countries. It may likewise be related to the overall economic performance of these countries

Figures 3 and 4 reveal the spectrum of fractality among and between the male and female population literacy rates of the 204 countries in the world. The computed fractal dimensions clustered on the low end of the spectrum indicating greater variability in literacy rates there. That is, the greater variability is rated in countries with high literacy rates for both men and women. The fractal spectrum however, clearly indicates that women have lower fractal dimensions on the lower end of the spectrum viz variations in the literacy rates for men are similarly pronounced even for lower literacy rate countries. The fractal spectrum for women does not display this pattern.

The computed fractal dimension for men at 1.800 signifies that the literacy rates for men across the globe deviates from uniformity by about 80%. In contrast, the computed fractal dimension for women logged at 1.600 signifying only a 60% deviation from uniformity. Countries in South Asia, Sub Saharan Africa and Afghanistan have very low literacy rates. In South Asia, close to one-half of the male population are illiterate while a third of the women are illiterate. Meanwhile, the situation is reversed in Afghanistan and Sub-Saharan Africa while illiteracy among women is more of a rule (more than half of the women are not functionally literate.)

The higher fractal dimension of literacy figures for men is indicative of the other dimensions of the issue of literacy in the mainly poor and struggling nations. Men are forced to work in order to fund for, usually, large families, at very early ages. Education is not a priority; survival is. While women share almost the same lot in life as the men in these countries, the pressure and demand to earn a living is much less. This accounts for the lower fractal dimension for women's literacy rate.

The Millennium Development Goal (No. 2) of eradicating illiteracy globally is, therefore, an issue that is inextricably linked with the issue if eradicating abject poverty (Goal 1). Unless poverty is squarely addressed first, basic education and hence, literacy will always remain a secondary priority.

Likewise, literacy is an issue that impinges on labor practices and laws in many underdeveloped nations. In some, the legal working age for men can be as low as 16 years old while in others, it is 21 years old. Child labor is a practice that is not legal in all countries, yet, there is preponderance of evidence to indicate that the practice is widespread in poorer countries (Incidence of Child Labor in the Philippines, 2010).

The forces that shape national policies on basic education are numerous covering economic, cultural, and political factors. Together, the dynamic interplay of these forces determines basic education outcomes on a national scale. For instance, in the Philippines, compulsory basic education is enshrined in the Constitution but a fast-growing population stretches the government's ability to support the constitutional mandates given the multifarious concerns in the other social services (health, housing, and public order). Realizing this to be the case, the Philippine Congress passed a controversial Reproductive Health Law (RHL) which aimed to rationalize population growth in 2012. This was a step in the direction of the sustainable growth but which met huge resistance from the Catholic Church. Predictably, since the country is 90% Christian, the RHL could become one of those laws that were not implemented. Should this happen, the spec of poverty will continue to haunt the country and universal literacy will remain a goal over the next decade.

5.0 Conclusion and Recommendations

The fractal dimensions obtained from the available data are observed to be high indicating very erratic patterns of literacy across nations. This study validates the insistent need to empower and reinforce the redirection of national policies in support for education. While men and women of today share the burden in economic growth and development, appropriate programs to increase their literacy rates are anticipated from the government with the active involvement of the private sectors. In this manner, literacy through education becomes a ticket to an empowered, improved and inclusive sustainable economy.

6.0 References

Arnold, D. Johnson, T. S (2010). "Global Functional Literacy: Status and Prospects for 2015" (Journal of Educational Researches, Vol. 43, (1), pp. 110-121)

Chun, S., Wang, K. (2010). "Functional Literacy in Southeast Asia, D". (Education Forum, Vol. 36 (2), pp. 67-82)

Padua, R; Palompon ,D; Ontoy, D (2012). "Data Roughness and Fractal Statistics" (CNU Journal of Higher Education, Vol. 4)

Santamaria, R.; Balesteros, D. (2008). " "Literacy and Functional Literacy in Underdeveloped Nations" (The Modern Educator, Vol. 68(4))

N.A (2012). 2008 Functional Literacy and Mass Media Survey

Similarity Index: 10%
Paper ID: 369136896