Mathematics Performance across Gender and Who Owns a School

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Abstract: *Mathematics performance has always been low in Tanzania among primary school learners. The low performance is contributed by multiple factors most of which emanate from the investment and usage of resources. Some schools especially the public ones are in most cases low resourced when compared with their counterpart private schools. The study compared results in mathematics at Primary School Leaving Examination (PSLE) between public and private schools and between boys and girls. The National Primary School Leaving Examination results of 2016 of twenty schools were analysed. Private schools were found to do better than public schools. Boys were found to do better than girls in general and in public schools. The study adds to the existing discussion about gender parity in mathematics performance. Recommendations made suggest more investment in resources and effective use of the same should be done especially in public schools. Suggestions are further made on addressing both school-based factors and how schools relate to the immediate surrounding society.*

Key Terms: mathematics performance, primary schools, gender, public, and private-owned schools

Introduction

Mathematics is one of the key subjects in the school curriculum in Tanzania primary and secondary education. The subject addresses logical mental growth, analytical skills and communicates multiple meanings in other subjects (Uwezo, 2011). The subject is very important in science and technology-related subjects all over the world (Sa'ad, Adamu & Sadiq, 2014; Shao, 2014) as its theories are highly applicable among them and in nearly all disciplines (Shao, 2014). Bhalalusesa, Westbrook, and Lussier (2011) advocate that the importance of mathematics is also for future educational endeavors. In the era of rapid scientific and technological development and a wish for underdeveloped countries to industrialize, mathematics is one of the vital study areas necessary to foster development.

Such a situation has made Tanzania to place the subject at the centre of the school curriculum by making it compulsory to both primary and ordinary secondary education (Kisakali & Kuznetsov, 2015; Uwezo, 2011).

To achieve the long-term educational aims learners may need to learn effectively the subject and perform well when it comes to examinations. Good performance of the subjects at lower levels of education motivates students and makes them to like the subject and builds up learners' self-esteem on their mathematical ability (Calder & Campbell, 2016). Furthermore, good performance enables learners to qualify or be selected to pursue mathematics and other subjects that apply mathematical knowledge base in higher levels of education. With specificity to primary education and mathematics, the Primary School Leaving Examination (PSLE) determines pupils who will proceed to secondary education (Kabote, Niboye & Nombo, 2014) and mathematics is one of the major areas contributing to their required cut-off point.

Despite the known importance of mathematics and the emphasis shown in policies and school curriculum, the performance of the subject among learners has always been very low (Kisakali & Kuznetsov, 2015; Mabula, 2015; UNESCO, 2011; Kabote, Niboye & Nombo, 2014). Zilimu (2014) in his doctoral study found out that the low performance of pupils in mathematics is also horrendous at a lower level such as in standard three.

The performance of mathematics may be subject to multiple factors. There is no singled-out factor solely responsible for the ill-performance of mathematics. Factors leading to poor performance of mathematics include among others: a shortage of mathematics teachers, shortage of mathematics textbooks, incompetence among mathematics teachers, negative altitude among teachers and learners, and unfriendly environment (Kabote, Niboye, & Nombo, 2014). Most of the factors listed above reflect challenges in resource investment. Quality and use of effective feedback in mathematics may also improve students' performance (Kyaruzi *et al*., 2019). In the schools where such challenges are addressed, performance is likely to be improved.

Most of the Tanzania primary schools of which the majority are public owned schools are low resourced. Yusta *et al*. (2016) support the view that there is an appalling shortage of teaching and learning resources especially audio-visual resources which accordingly affect pupils learning of mathematics. The schools are marked with high enrollment rates (Developing Countries Strategies Group, 2009). Schools face shortages of classrooms and desks for learners to sit on (HakiElimu, 2014).

However, there are, though few in number, private-owned schools many of which are well resourced. Private owned schools are also not congested with multitudes of students, the situation which reduces resource competitions in the schools. HakiElimu (2014) contends that public and private schools operate in two quite different education milieus.

Boys and girls' study in the same schools and the factors mentioned earlier are gender insensitive. However, Kabote, Niboye and Nombo (2014) and Jones and Smart (1995) contend that girls' performance in almost all schools was below that of boys. Kabote, Niboye, and Nombo (2014) argue that in general boys performed better in mathematics than girls with a few exceptions. Furthermore, in other parts of the world, there is a belief that mathematics is a male domain (Brandell & Staberg, 2008; Jones & Smart, 1995). Unlike Kabote, Niboye and Nombo (2014) whose findings address the comparison between urban and rural-based schools, this paper explores the same issues but across ownership in urban-based schools. Specifically, the paper looks at the extent to which gender is likely to have been addressed even in good performing schools. While the difference in performance between private and public schools seems to be obvious, the gender aspect seems to have been given less attention (Ngware *et al*., 2012). Therefore, this paper attempts to analyze the differences in mathematics performance between the public and private-owned primary schools but with a critical look at gender differences. As such it also tackles the analysis of the performance of mathematics across gender. The study presupposed that there was no difference in mathematics performance at PSLE between public and private-owned schools. It also presupposes that there was no difference in mathematics performance at PSLE between boys and girls.

Methodology

The study was designed to compare PSLE mathematics results between public and private schools as well as between boys and girls. The study used the 2016 PSLE mathematics grades. There were no manipulations of the subjects. The study analysed results from twenty primary schools all of which are located in the urban Ilala district in Dar es Salaam region of Tanzania Mainland. In total, the schools had 2,355 (1,170 (49.7%) boys and 1,185 (50.3%) girls) whereby 1,208 (561 boys and 647 girls) of the pupils came from public schools and 1,147 (609 boys and 538 girls) pupils came from private schools. The district was chosen as its demography is relatively uniform by having all schools located in the centre of Dar es Salaam city.

The district also had a relatively high number of private schools, the factor which made it possible to select ten private and ten public schools with a reasonable number of learners. There were 108 schools in the district. Multistage sampling was used to obtain the schools. First, 80 schools that had forty or more pupils were identified for the study. Two strata were then

formed: 64 public and 16 private schools. Ten schools were randomly selected from each stratum. Their mathematics results were obtained from the National Examination Council of Tanzania (NECTA) and were analysed with the help of the SPSS version 20. A comparison between the performance of public and private schools and between boys and girls was calculated and the level of significance was established by the Chi-Square test of independence.

Findings

The NECTA pupils' grades in mathematics were recorded A, B, C, D and E. The grades were fed into the SPSS as A = 5, B = 4, C = 3, D = 2 and E = 1 for both public and private schools. Public schools had 135As, 221Bs, 374Cs, 412Ds, and 66Es, while private schools had 362As, 302Bs, 329Cs, 146Ds, and 8Es. This information was put in a line graph below.

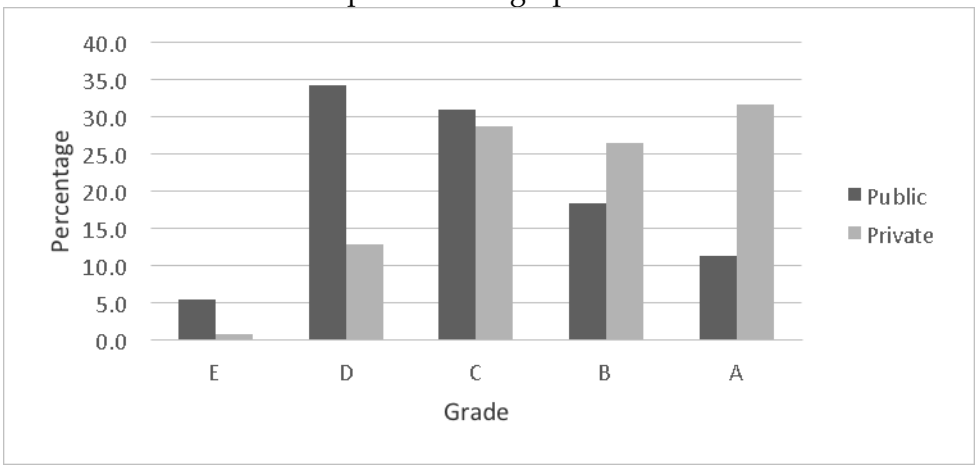

Figure 1: Performance in mathematics for public and private schools

The difference in performance of mathematics in public and private schools was run through the Chi-Square test of independence to determine its significance. The test showed that Chi-Square; $X^2(4, N = 2355) = 289.982$, $p < .05$. This means that there is actually a significant difference in the performance of mathematics between pupils from public and private schools.

First, the comparison was made by comparing the performance of boys and girls from all the twenty schools. Second, the comparison was made within the categories as either public or private. In the first case, there were 1 170 boys and 1 185 girls. It was found out that there were 289As, 261Bs, 325Cs, 265Ds, and 30Es for the boys, 208As, 262Bs, 378Cs, 293Ds, and 44Es for the girls. The general performance between boys and girls was descriptively put in a line graph as seen hereafter.

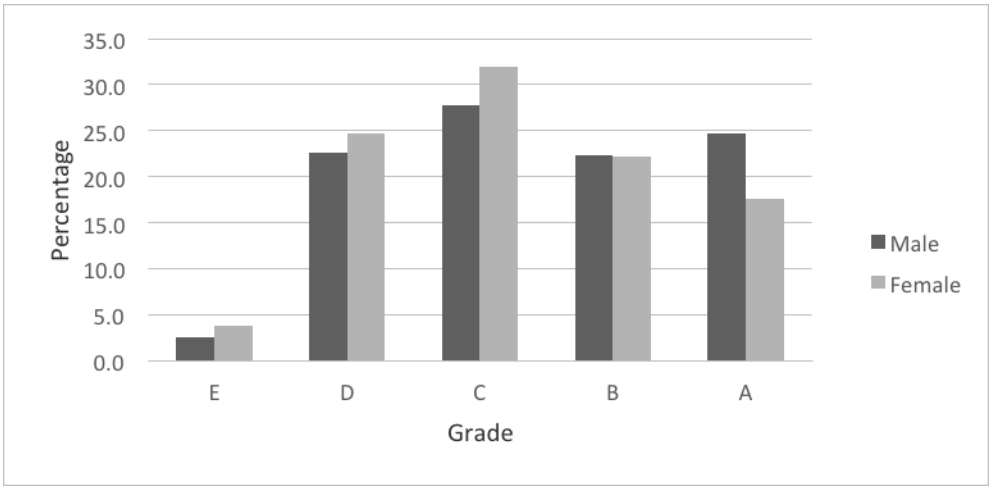

Figure 2: Performance in mathematics for boys and girls in primary schools

This difference was again put into the Chi-Square test of independence to determine if the difference was statistically significant. The test showed that Chi-Square $X^2(4, N = 2355) = 21.158$, $p < .05$. Thus, the difference in the performance of mathematics between boys and girls was statistically significant.

Further comparisons were done to check if the difference in mathematics performance between boys and girls is significant within the two categories of schools. In public schools, the boys had 82As, 93Bs, 165Cs, 193Ds, and 28Es while girls had 53As, 128Bs, 209Cs, 219Ds, and 38Es. The test showed that Chi-Square $X^2(4, N = 2355) = 14.054$, $p < 0.05$. This difference is statistically significant. In private schools, the boys had 207As, 168Bs, 160Cs, 72Ds, and 2Es and girls had 155As, 134Bs, 169Cs, 74Ds, and 6Es. The test showed that Chi-Square $X^2(4, N = 2355) = 9.211$, $p > 0.05$. Unlike in the case of public schools, in private schools, the difference in performance between boys and girls is not statistically significant. Graphically this information can be seen as in the following figures.

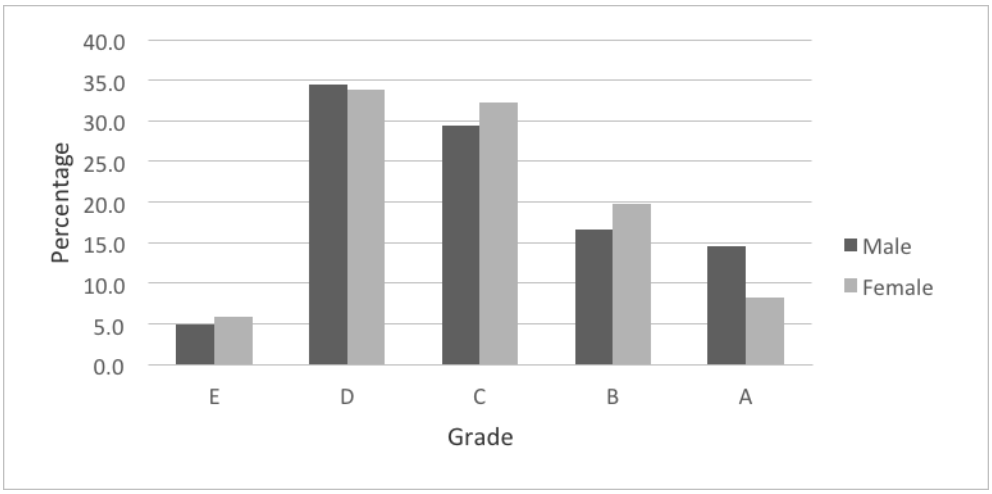

Figure 3: Performance in mathematics for boys and girls in public schools

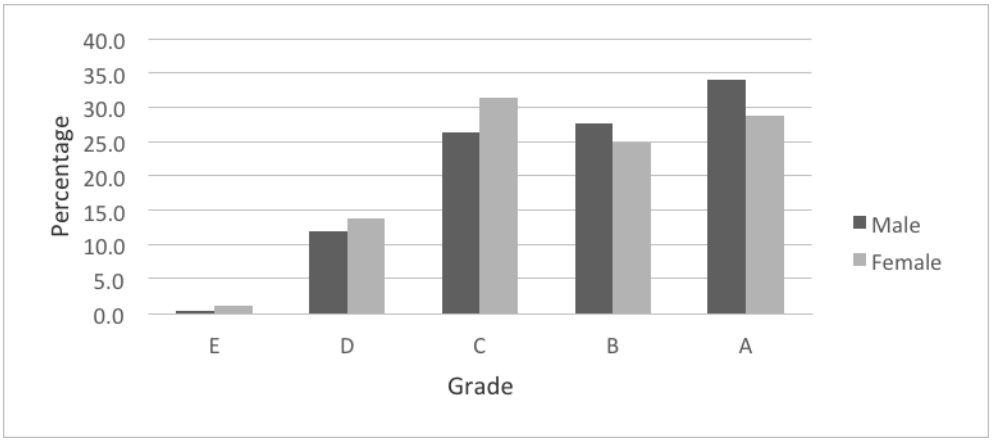

Figure 4: Performance in mathematics for boys and girls in private schools

Discussion

The study investigated the difference in mathematics performance between public and private-owned schools as well as across gender. The study found out that there is a significant difference in the performance of mathematics between public and private schools. While other studies such as that of Kabote, Niboye and Nombo, (2014) show differences in mathematics performance between rural and urban primary schools, in this paper such differences have been explained to exist between private and public primary schools in an urban area. As the performance is assumed to be affected by multiple factors, specific factors are yet to be explored that account for differences in mathematics performance between public and private primary schools. In order to improve performance in public primary schools at least to the same level as private-owned primary schools, the public sector has to learn from its counterpart private sector.

Furthermore, as the criterion to study mathematics and other related subjects and disciplines is doing well in mathematics (Ngware *et al*., 2012), then it can be implied that pupils who come from private schools are more likely to advance in mathematics and related fields than those in public schools. This suggests that by virtue of being in a public school one is likely to be disadvantaged when it comes to advancing in mathematics. While the public sector is hereby called upon to improve the learning process and consequently performance in mathematics, the ministry and other stakeholder organizations should consider learners' backgrounds based on the type of school ownership when it comes to selections.

Public schools provide education relatively free while private schools levy a reasonably high amount of money, which common people who are the majority of Tanzanians find it difficult to pay. As a result, private schools accommodate children from families, which are well-off economically while public schools accommodate children from families which are not well-off economically. In this case, the difference in mathematics performance between public and private schools may actually be the difference in mathematics performance between the rich and the poor. Also, as noted earlier that mathematics performance in lower levels of education affect motives and chances to proceed in the same and related fields, those who cannot afford to study in private schools are less likely to perform better in mathematics and as a result, may become disadvantaged when competing for opportunities of higher levels of education.

Gender issues were also examined from the mathematics performance viewpoint. This was important since most literature in Africa and Tanzania, in particular, discusses gender parity in terms of enrolment (Ngware *et al*., 2012). This leaves a gap in explaining the outcome of such enrolment especially when it comes to achievement. In this study generally, boys were seen to do better in mathematics than girls. These findings are supported by Kabote, Niboye, and Nombo (2014). The difference was also significant within the public schools' category. However, in private owned schools the difference in mathematics performance between boys and girls was statistically non-significant. This raises the discussion as to whether gender gaps truly exist in a well-established school (Ngware *et al*., 2012). Using similar data from standardized mathematics tests from the US, Hyde *et al*. (2008) dismiss the view that there is a gender gap in mathematics. The study did not address gender issues leading to the differences in mathematics performance but it identified that there are differences in the performance and therefore there may be school-based factors that affect mathematics performance across gender.

Additionally, the differences in mathematics performance between girls and boys may not be the result of school-based interaction alone but the general

social life of the pupils (Guiso *et al*., 2008). In fact, countries where boys seem to do better than girls in mathematics, Tanzania inclusive, have been reported to have the lowest gender-related development index (UNDP, 2005). Therefore, the education stakeholders need to investigate the gender issues surrounding primary school children which affect their mathematics performance be it school or out of school factors. Addressing such hindrance factors among girls and society at large may increase the number of girls doing better in mathematics and who may advance in mathematics and the related fields to higher levels.

Limitation of the study

The study was delimited to standardized mathematics primary school leaving examination performance data. As such the discussion was limited to this data and further research is needed in order to explore the various factors that affect mathematics performance and lead to differences in gender parity especially for public schools. Furthermore, gender parity seems to be a societal phenomenon that is not limited to the school environment alone. Therefore, future research may explore how private and public schools situate themselves within society.

Conclusion

The study was done to compare the mathematics performance between public and private schools as well as between boys and girls. There were notable differences in mathematics performance between public and private schools as well as between boys and girls. Pupils in private schools were found to perform better than those in public schools. Also, boys were found to perform better than girls in public primary schools. This suggested that public schools may not equitably be providing the required learning interaction milieu to boys and girls. Furthermore, the difference in mathematics performance between boys and girls may be attributed to other factors beyond the school environment that are still worth addressing. Unless these causative challenges are identified and addressed, public schools where the majority of children who come from poor families are found to obtain their education will continue to underperform. Also, unless gender issues are well addressed, girls will continue to be left behind despite individual efforts they may make especially in public-owned schools.

References

Bhalalusesa, E., Westbrook, J. & Lussier, K. (2011). *Teacher preparation and continuing professional development in Africa (TPA): the preparation of teachers in reading and maths and its influence on practices in Tanzania primary schools.* University of Sussex: Centre for International Education.

Brandell, G. & Staberg, E. M. (2008). Mathematics: a female, male or gender-neutral domain? a study of attitudes among students at secondary level. *Gender and Education 20*(5), 495-509.

Calder, N. & Campbell, A. (2016, February 03). Using mathematical apps with reluctant learners. *Digital Experiences in Mathematics Education; 2*(1), 50-69.

Developing-Countries-Strategies-Group (2009). *Mathematics in Africa: challenges and opportunities.* International Mathematical Union.

Guiso, L., Monte, F., Sapienza, P. & Zingales, L. (2008). Culture, gender, and math. *Science, 3*20(5880), 1164-1165.

HakiElimu (2014). *Teaching effectiveness in primary and secondary schools in Tanzania.* Dar es Salaam: Author.

Hyde, J. S., Lindberg, S. M., Linn, M. C., Ellis, A. B. & Williams, C. C. (2008). Gender similarities characterize math performance. *Science,* 321(5888), 494-495.

Jones, L. & Smart, T. (1995). Confidence and mathematics: a gender issue? *Gender and Education 7*(2), 155-166.

Kabote, S. J., Niboye, E. P. & Nombo, C. I. (2014). Performance in mathematics and science subjects: a gender perspective for selected primary schools in rural and urban Tanzania. *International Journal of Gender and Women's Studies 2*(3), 87-105.

Kisakali, J. & Kuznetsov, D. (2015). Modeling factors influencing mathematics learning and performance in Tanzanian secondary schools. *Asian Journal of Mathematics and Applications (0244)*, 1-11.

Kyaruzi, F., Strijbos, J.-W., Ufer, S. & Brown, G. T. (2019). Students' formative assessment perceptions, feedback use and mathematics performance in secondary schools in Tanzania. *Assessment in Education: Principles, Policy & Practice*, DOI:10.1080/0969594X.2019.1593103.

Mabula, S. (2015). Modeling student performance in mathematics using binary logistic regression at selected secondary schools: a case study of Mtwara municipality and Ilemela District. *Journal of Education and Practice 6* (36), 96-103.

Ngware, M. W., Ciera, J., Abuya, B. A., Oketch, M. & Mutisya, M. (2012). What explains gender gaps in maths achievement in primary. *London Review of Education, 10*(1), 55–73.

Sa'ad, T. U., Adamu, A. & Sadiq, A. M. (2014). The causes of poor performance in mathematics among public senior secondary school students in Azare metropolis of Bauchi state, Nigeria. *Journal of Research & Method in Education, 4*(6), 32-40.

Shao, D. (2014). MoMath: an innovative design of a mobile-based system for supporting primary school mathematics in Tanzania. *International Journal of Computer Applications (0975 – 8887); 95*(15), 22-27.

UNDP (2005). *Human development report 2005: international cooperation at cross roads, aid, trade and security in unequal world.* New York: United Nations Development Programme.

UNESCO (2011). *Tanzania education sector analysis: beyond primary education, the quest for balanced and efficient policy choices for human development and economic growth.* Dar es Salaam: UNESCO.

Uwezo (2011). *Are our children learning?: annual learning assessment report.* Dar es Salaam: Uwezo.

Yusta, N., Karugu, G., Muthee, J. & Tekle, T. (2016). Impact of instructional resources on mathematics performance of learners with dyscalculia in integrated primary schools, Arusha city, Tanzania. *Journal of Education and Practice 7*(3), 12-18.

Zilimu, J. A. (2014). *Exploring the gender gap in Tanzania secondary school mathematics classrooms: unpublished doctoral dissertation.* Urbana: University of Illinois.