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AN EXAMINATION OF THE IMPACT OF TEACHER FACTORS ON MATHEMATICS PERFORMANCE OF LEARNERS WITH DYSCALCULIA IN PUBLIC PRIMARY SCHOOLS IN STAREHE SUB-COUNTY, NAIROBI CITY COUNTY, KENYA

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Abstract:
The purpose of this study was to examine the impact of teacher factors on the Mathematics performance of learners with dyscalculia in public primary schools in Starehe Sub-county, Nairobi City County. The study was guided by the social development theory of learning by Vygotsky (1978). The study was a mixed-method research applying a descriptive survey design. The target population was class seven pupils and their Mathematics teachers in 4 public primary schools in Starehe Sub-county. A sample size of 42 class seven pupils and 8 class seven Mathematics teachers were used. The purposive sampling technique was used to select teachers where only Mathematics teachers for class seven were sampled. A simple random sampling technique was used to select the learners. Data from the teachers was collected using a questionnaire. On the other hand, data from the pupils was collected using the Dyscalculia Screening Tool (Wechsler Intelligence Scale for Children - WSIC III). School records were also examined to assess pupils' Mathematics performance. Quantitative data were analyzed through descriptive statistics of frequencies, percentages and mean with the help of the Statistical Package for Social Sciences (SPSS). Qualitative data was analyzed by organizing it into

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themes corresponding to the study objectives and used to enhance the quantitative findings. Findings indicated that most teachers had a strong positive attitude towards Mathematics and their teaching profession in general which on stood at a mean of 4.4 on a scale of 5. Concerning the effect of the different teacher factors assessed on pupils' Mathematics performance, teachers' attitude had the highest mean (4.9) followed by teachers' workload (mean = 4.8) and teaching experience (mean = 4.5). The study concludes that although the majority of the Mathematics teachers in public schools in the sub-county have vast teaching experience, few have acquired formal training in special needs education. Overall, teachers' factors greatly affect pupils' Mathematics performance in public primary schools. Teachers' academic qualifications also affect the pupils' Mathematics performance but to a lesser extent compared to teachers' attitude, teachers' workload and teaching experience. The study recommended that the government, through the Ministry of Education, need to consider organizing in-service training for primary school teachers with Mathematics learning disabilities.

Keywords: learners with dyscalculia, teacher factors, performance in Mathematics, public primary school

1. Introduction

Dyscalculia is a kind of Mathematics disability that manifests as major difficulties in basic calculations and numerical memory (Nfon, 2016). Mathematics disabilities such as dyscalculia may have a major negative effect on a person's life given that, Mathematics is fundamental in human life by virtue that it is essential in everyday activity in most modern cultures (Libertus, Feigenson & Halberda, 2011). From a global perspective, performance in Mathematics especially in the upper primary level of education is generally poor in most countries, both developed and developing countries. Vania and Xin (2014) highlighted that most countries in East Asia (such as Hong Kong, Japan, Korea, China and Singapore) record high Mathematics performance in international rankings like PISA compared to other countries in the World. Several developed countries had a mean score below the OECD average. Some of the factors attributed to good Mathematics performance in East Asian countries include good teaching strategies; quality instructions; good teacher-student relationships; strong family support; and good school climatic attributes such as disciplinary climate among others (Ma, Jong & Yuan, 2013).

In Africa, Mathematics performance is quite wanting in most countries. In Nigeria, Israel ad Olubunmi (2014) conducted an investigation on the impact of students' dyscalculia and dyslexia on the teaching and learning of science and mathematics among secondary school students. In Uganda for instance, it has been affirmed that students consistently perform poorly in the subject and this has even made the country lose some economic advantage (Kiwanuka, Van Damme, Noortgate, Anumendem & Namusisi, 2015). In Rwanda, poor Mathematics performance is quite common too as exposed by

Gichuru and Ongus (2016). In Tanzania, Yusta, Karugu, Muthee and Tekle (2016) conducted a study on the impact of instructional resources on mathematics performance with dyscalculia in integrated primary schools in Arusha City.

A local study conducted in Kenya on the influence of learning support strategies on the academic performance of learners with dyscalculia in Nairobi County revealed that differentiated assessments and tests were the highest indicators of influence on the academic performance of learners with dyscalculia (Nyaga, 2012). Mathematics performance has been relatively poor and appallingly low all over the country (Karigi & Tumuti, 2015). In Nairobi County where this study was conducted, poor Mathematics performance has been reported in public primary schools in Starehe Sub-county. Yet, while some studies have been done on learning disabilities and Mathematics performance in Nairobi County and Kenya at large, few have investigated the occurrence of dyscalculia and the factors influencing the Mathematics performance of dyscalculic learners in Starehe Sub-county. This study, therefore, sought to bring to the limelight the predictors of Mathematics performance among learners with dyscalculia with regard to teacher factors in public primary schools in Starehe Sub-county.

1.1 General Objective

The purpose of the study was to assess performance and the predictors of Mathematics performance among learners with dyscalculia in public primary schools in Starehe Sub-county, Nairobi City County.

1.2 Specific Objective of the Study

Specifically, the study sought to examine the impact of teacher factors on Mathematics performance of learners with dyscalculia in public primary schools in Starehe Sub-County, Nairobi City County.

2. Literature Review

2.1 Theoretical Review

The study was guided by the social development theory of learning by Vygotsky (1978). This theory asserts two major themes concerning social interaction, the more knowledgeable other (MKO), and the zone of proximal development (ZPD). Based on the context of this study, more knowledgeable other (MKO) refers to the Mathematics teacher with a higher ability level than the learner who impacts learning through social interaction. The ZPD tries to define a bridge between what is known and the unknown. According to Vygotsky, the learner is able to progress in their cognitive development if a capable adult supports and encourages him/her to do so. Thus, using effective teaching approaches teachers would be able to help the child facing challenging tasks to master them individually, through guidance and encouragement.

This study relied on the social development theory of learning because close interaction between the teacher and the pupils facilitates close observation of the child's areas of Mathematics learning disabilities. Learners with dyscalculia take an active role and require a skilful educator, where MKO can identify learners with MLD. This has been successfully used by other scholars like Tuchura (2016). The same belief also applied to learners with dyscalculia on how they select what to understand in a given content that is being taught by a teacher in class.

2.2 Empirical Studies and Knowledge Gaps

According to the Bureau of Labor Statistics U.S.A, children with learning disabilities should be taught by teachers equipped well with skills, and knowledge of appropriate strategies in teaching (Njuguna, 2012). Since Dyscalculia is a component of Mathematics learning disability, teachers who have such students should be professionally trained in special needs education. According to Yusta (2015), most teachers in integrated primary schools in Tanzania have special education training at different levels but not in learning disabilities, which is a major obstacle for them to effectively teaching learners with dyscalculia. Another study by Kibuthu (2016) in Nyeri Central Sub-county revealed that the majority of the teachers were trained in special needs education. Njeru (2012), found that 55% of the respondents had professional training in handling dyscalculics and 44% without.

Teachers' competence and experience in teaching learners with dyscalculia are crucial. According to Khing (2016), a child with dyscalculia requires extra support from an experienced special education teacher or another qualified therapist. Yusta (2015) while assessing Mathematics teachers for learners with dyscalculia revealed that nearly 50% had a teaching experience of below five years. On Teachers' Professional competence, Tuchura (2016) observed that out of 179 teachers in the sampled schools only 3 were well experienced in SNE. In a study by Kiplagat, Role and Makewa (2012), it was indicated that the number of pupils was large, which caused teachers though experienced to fail to use different teaching methods. However, the reviewed studies did not show how teachers' experience and workload are related to the performance of dyscalculic learners. None of the studies assessed the experience of the teachers in the handling of learners with dyscalculia or the teacher's workload in the public primary schools in Starehe Sub-county.

2.3 Conceptual Framework

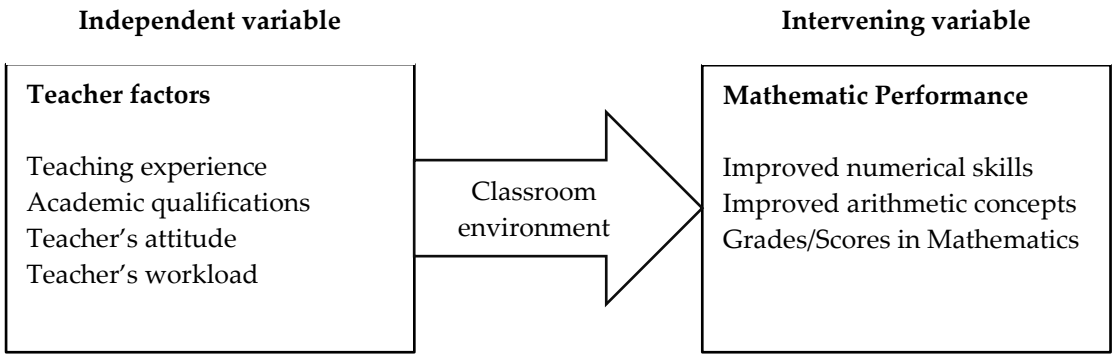

Figure 1: Conceptual Framework

3. Methodology

3.1 Research Design and Target Population

This research applied a descriptive survey design. This design attempts to show the status quo of study items (Cooper & Schindler, 2006). The design provides the present picture of a situation as it naturally happens (Salaria, 2012). Using the descriptive survey design can therefore help in the formulation of knowledge and solutions to the existing problem. The design is thus considered appropriate for this study because it will enable the researcher to get information on assessing the predictors of Mathematics performance among learners with dyscalculia in public primary schools in Starehe Sub-county Kenya. The study targeted 60 Mathematics teachers in Starehe Sub-county who teach standard seven as well as 400 class seven pupils in the 4 public primary schools in the Sub-county. Class seven pupils were selected for the study because they had developed Mathematics skills and were hence likely to communicate effectively as they engage with the instruments. In addition, the learners in this class were not under pressure to sit for KCPE which is done upon completion of class eight.

3.2 Sampling Techniques and Sample Size

The study used a purposive sampling technique to select the primary schools to be included where only the 4 public primary schools in Starehe Sub-county were selected. Purposive sampling was also used to select 8 Mathematics teachers for class seven were sampled. The sample size for the study consisted of 42 class seven pupils and 8 class seven Mathematics teachers (special and regular if any) in the four targeted public primary schools. Therefore, the total sample size that was used was 50 respondents which is equivalent to 10.9% of the total population (460).

3.3 Research Instruments

Mathematics teachers' questionnaire, interview guide for headteachers, learners' research instruments (Wechsler Intelligence Scale for Children; Mathematics Self Efficacy

Scale (MSES); Cognitive abilities assessment too) and document analysis guide were used to collect data.

3.4 Pilot Study

Pilot testing was done in one of the primary schools in Starehe Sub-county. Using purposive sampling the researcher selected 1 Mathematics teacher and 2 class seven pupils. The piloting helped discover weaknesses in the instruments like unclear questions cited by the respondents. To enhance the face validity of the instrument, the pilot study questionnaires were scrutinized to identify items that seem unclear and ambiguous to the respondents. Such items were reviewed and restructured using simplified items. For the content validity of the instruments, the researcher sought professional consultation from the supervisors and lecturers in the Department of Special Education who are well versed in the area that was being studied. To establish the reliability of the instruments, the researcher obtained a coefficient of reliability using Pearson product-moment correlation between pre-test and post-test scores achieved. The correlation coefficient of 0.75 was considered appropriate for the reliability of the instruments.

3.4 Data Collection Procedures, Analysis and Presentation

After completing the data collection process, the data were first checked for completeness and cleaned. The cleaned data were then coded. The coded data was then entered into a computer program – that is, Statistical Package for Social Sciences (SPSS) version 25, whereby the quantitative data was reported through descriptive statistics – frequencies, percentages and mean. The findings were presented using tables, bar graphs and pie charts. Qualitative data from open-ended questions were analyzed through the content analysis method. In this regard, the qualitative data was organized into themes in line with the study objectives and used to enhance the discussion on quantitative findings.

4. Results and Discussions

Results have been presented and discussed in different sections: bio-data and findings based on the research objective.

4.1 Bio-Data of the Respondents

Out of the 8 teachers engaged in the study, 4 (50%) were female, 3 (37.5%) were male while 1 (12.5%) did not indicate their gender. This indicates that most of the Mathematics teachers in public primary schools in Starehe Sub-county are female. This would be more advantageous in accommodating learners with dyscalculia. This is attributed to the fact that studies are constantly upholding that female teachers have more accommodative attitudes than males, especially in developed countries like the United States ((Upton &

Harper, 2000; Hunt & Hunt, 2000). On age-bracket, half of the teachers (50%) were 41-50 years old while 37.5% were over 50 years.

Table 1: Teachers' demographic information

Aspect		**Frequency**	**Percent**
Gender	Male	3	37.5
	Female	4	50.0
	No response	1	12.5
Age-bracket	41-50 years	4	50.0
	Over 50 years	3	37.5
	No response	1	12.5

4.2 Teacher Factors and Mathematics Performance of Learners with Dyscalculia

4.2.1 Teachers' Academic Qualification, Knowledge and Skills in SNE

Table 2: Teachers' academic qualifications

Education level		**Frequency**	**Percent**
Valid	Bachelor's degree	6	75.0
	Diploma	1	12.5
	AT IV	1	12.5
	Total	8	100.0

The majority of the teachers (75%) indicated that they had a Bachelor's degree while 12.5% had a diploma and the rest 12.5% had AT IV. This means that majority of class seven Mathematics teachers in public primary schools in Starehe Sub-county have a high level of education. This is critical since according to Njuguna (2012), pupils with learning disabilities require well-trained teachers with high professional qualifications and knowledge of good teaching strategies.

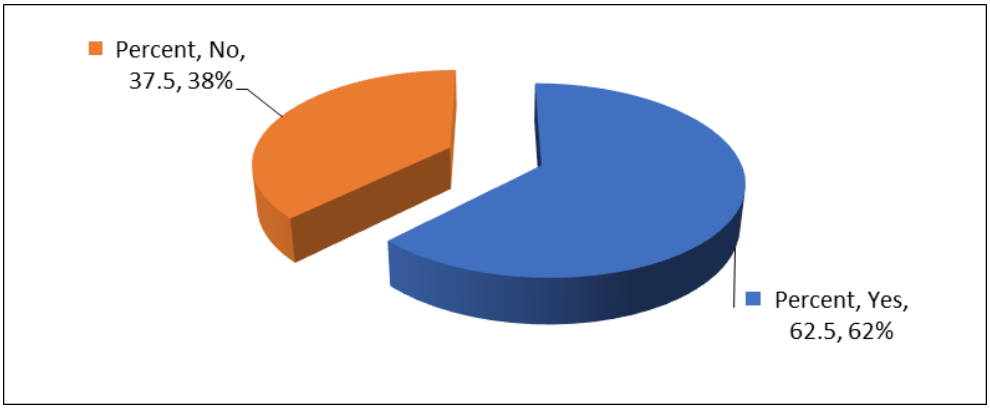

Figure 2: Trained/untrained teachers in SNE

Most of the teachers (62.5%) asserted that they had been trained in SNE while the rest 37.5% had no training whatsoever in SNE. This implies that most of the Mathematics teachers in public primary schools in Starehe Sub-county have some skills in SNE. The

findings concur with the study by Kibuthu (2016) in Nyeri Central Sub-County that revealed that the majority of the teachers were trained in SNE.

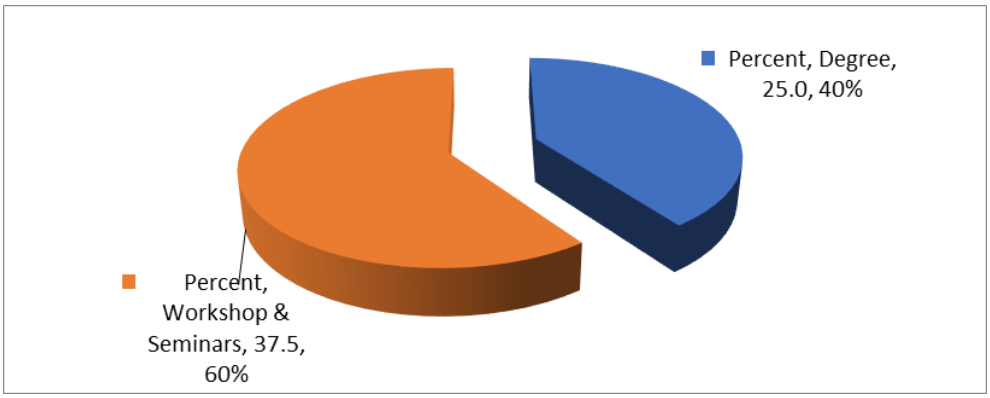

Figure 3: Teachers' level of training in SNE

Out of the 62.5% who had been trained in SNE, 37.5% had only trained through attending workshops and seminars with only 25% having acquired a degree in special needs education. This implies that among Mathematics teachers in public primary schools in Starehe Sub-county, only a few of them have acquired formal university training in special needs education.

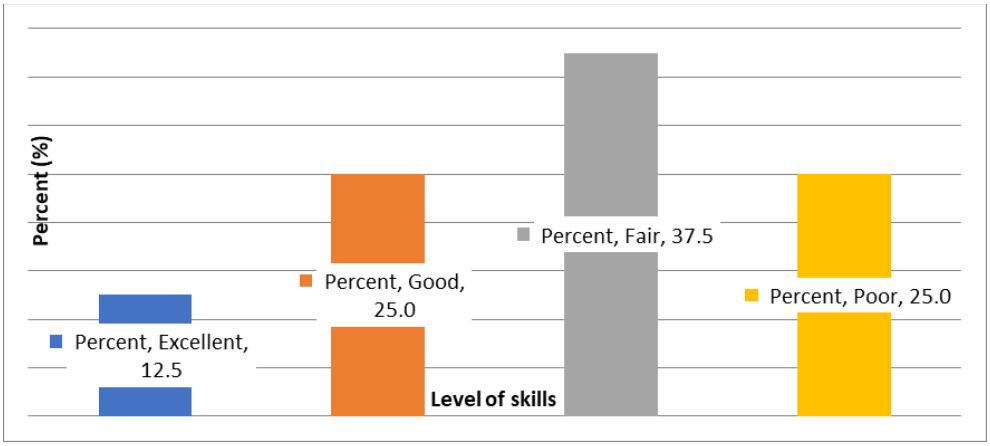

Figure 4: Teachers' perception on their level of skills in SNE

In their perception, 37.5% of the teachers rated their skills in SNE as fair while 25% rated themselves as poor in SNE skills. Even so, 25% alleged that they were good in SNE with 12.5% considering themselves excellent in SNE. This is an indication that the majority of the Mathematics teachers in the schools acknowledge their inadequacy in SNE skills. This concurs with Tuchura (2016) whose findings also revealed that out of 179 teachers in the sampled schools only 3 were well experienced in SNE.

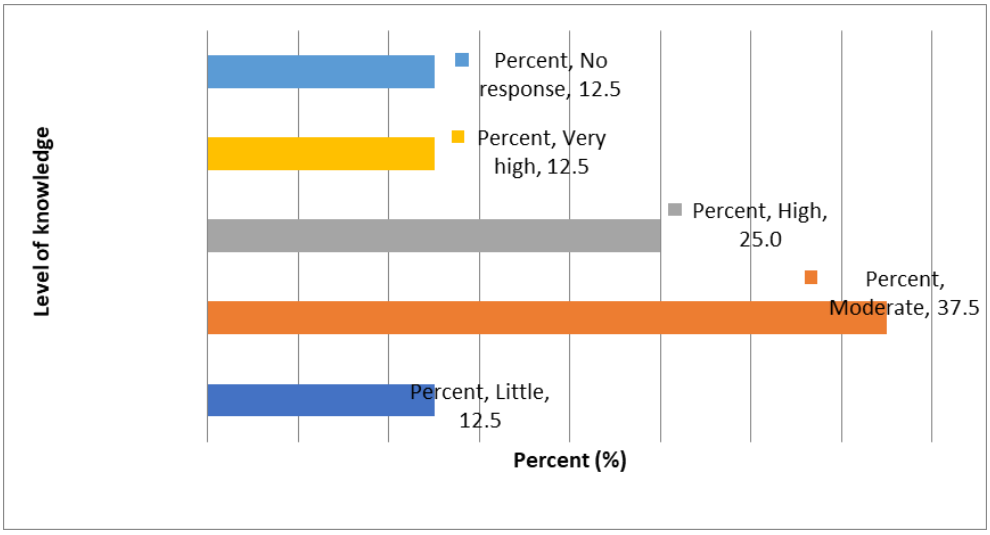

Figure 4.1: Teachers' perception of their level of knowledge in MLD

Several teachers (37.5%) rated their knowledge in MLD as moderate while 12.5% confessed they had little knowledge in MLD. There were however a few (25%) of them who alleged to have high knowledge of MLD. The findings indicate that most of the Mathematics teachers in the schools only have moderate skills in MLD. This agrees with Yusta (2015) who indicated that most teachers in integrated primary schools in Tanzania had special education training at different levels but not in mathematics learning disabilities, which is a major obstacle for them to effectively teaching learners with dyscalculia.

4.2.2 Teachers' Experience

The teachers' experience was analyzed on the basis of how long they had taught mathematics in their careers. Table 3 below presents the findings.

Table 3: Teachers' experience in teaching Mathematics

Duration of teaching Mathematics		Frequency	Percent
Valid	3 – 7 years	1	12.5
	7 – 10 years	2	25.0
	Over 10 years	5	62.5
	Total	8	100.0

Most of the teachers (62.5%) alleged that they had taught Mathematics for over 10 years while 25% had taught it for 7-10 years. Only 1(12.5%) had been teaching Mathematics for 3-7 years. This shows that the majority of the Mathematics teachers in the public primary schools in Starehe Sub-county have more than 7 years of teaching experience in Mathematics. It, therefore, implies that teachers' experience varies from one context to another since the findings disagree with Yusta (2015) who found that most of the Mathematics teachers (nearly 50%) had a teaching experience of less than 5 years.

4.2.3 Teachers' Attitude

To investigate the teachers' attitude towards Mathematics and career at large by presenting a set of statements to them that indicated proposed facets of a positive attitude. The teachers then indicated their agreement/disagreement with the statement on a scale of 1 to 5 where 1 was strongly disagree, 2 was disagree, 3 was neutral, 4 was agree and 5 was strongly agree. The mean and standard deviation was then calculated for the rating as presented in Table 4 below.

Table 4: Mathematics teachers' attitude towards their career

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Dev
Mathematics is my favorite subject	-	-	-	25.0	75.0	4.8	0.46
I enjoy teaching Mathematics	-	-	-	37.5	62.5	4.6	0.52
I always like to help someone who cannot understand Mathematics easily	-	-	-	62.5	37.5	4.4	0.52
I am happy that I was allocated to teach class seven Mathematics	-	-	12.5	50.0	37.5	4.3	0.71
I generally love my profession as a teacher	-	-	25.0	37.5	37.5	4.1	0.83
Average						**4.4**	**0.61**

Teachers' attitudes on average rated at a mean of 4.4 with a relatively low std. deviation of 0.61. This implies that the majority of class seven Mathematics teachers in the schools have a strong positive attitude towards their job. The majority attested that Mathematics was their favourite subject (mean = 4.8) and affirmed that they enjoy teaching Mathematics (mean = 4.6), while asserting that they always like to help those who cannot understand Mathematics easily (mean = 4.4). The findings indicate a highly positive teachers' attitude towards mathematics in the public primary schools in Starehe Sub-county, Kenya. This agrees with Awofala (2016) who revealed that mathematics teachers in Nigeria had a positive and high attitude towards mathematics.

4.2.4 Teachers' Workload

Teachers' workload was assessed on the basis of the number of lessons they had per week and the number of pupils in their respective classes.

Table 5: Number of lessons per week for the teacher

No. of lessons in a week		Frequency	Percent
Valid	Less than 25 lessons	1	12.5
	25-30 lessons	2	25.0
	31-35 lessons	5	62.5
	Total	8	100.0

Most of the teachers (62.5%) indicated that they had 31-35 lessons per week. Only 1(12.5%) of the teachers had less than 25 lessons per week. Moreover, all the 8 teachers (100%) attested that the number of pupils in class seven in their respective schools was more than 60. This is an indication that the majority of class seven Mathematics teachers have a huge workload which may negatively affect their effectiveness in teaching. This concurs with Kiplagat et al. (2012) whose study findings indicated that teachers had to struggle with the high workload brought about by a large number of pupils were large, which caused teachers though experienced to fail to use different teaching methods.

4.2.5 Effect of Teachers' Factors on Pupils' Mathematics Performance

To understand the effect of the teachers' factors on mathematics performance, the teachers were asked to rate the extent that which each of the teachers' factors. This was rated on a scale of 1 to 5 where 5 was very great extent, 4 was great extent, 3 was moderate extent, 2 was little extent and 1 was no extent at all. Table 4.9 below presents the findings.

Table 6: Perception on effect of teachers' factors on Mathematics performance

Factor	No extent at all	Little extent	Moderate extent	Great extent	Very great extent	Mean	Std. Dev.
Teaching experience	-	-	-	50.0	50.0	4.5	0.53
Teacher's academic qualifications	-	12.5	25.0	62.5	-	3.5	0.76
Teacher's attitude	-	-	-	12.5	87.5	4.9	0.35
Teacher's workload	-	-	-	25.0	75.0	4.8	0.46
Average						4.4	0.53

The overall effect of teachers' factors on pupils' Mathematics performance was rated at a mean of 4.4. There were also minimal deviations from the mean (SD= 0.53). This implies that teachers' factors greatly affect pupils' Mathematics performance in public primary schools. Teachers' attitude had the highest mean (4.9) followed by teachers' workload (4.8) and teaching experience (4.5). Teachers' academic qualifications had the least mean at 3.5. The findings indicate that teachers' attitude, teachers' workload and teaching experience are the most critical in determining Mathematics performance among class seven pupils. This concurs with Toropova, Johansson and Myrberg (2019) who indicated that teacher characteristics including teaching experience have a significant effect on learners' mathematics performance.

5. Conclusions

The study also concludes that although the majority of the Mathematics teachers in public schools in the sub-county have vast teaching experience, few have acquired formal training in special needs education. Consequently, they lack sufficient skills and knowledge on MLD and how to handle pupils with MLD. The teachers have a heavy teachers' workload in terms of large class sizes and many lessons per week. Nevertheless, they still have a strong positive attitude towards their job. Overall, teachers' factors greatly affect pupils' Mathematics performance in public primary schools. In particular, the study concludes that among the different teachers' factors, teachers' attitude exerts the greatest effect, followed by teachers' workload and teaching experience.

6. Recommendations

1) The government through the Ministry of Education should consider organizing on-job training for primary school teachers with Mathematics learning disabilities. In such trainings, Mathematic teachers should be sensitized to the importance of screening pupils for dyscalculia and trained on how to use different tools to screen the pupils. This may help to boost the skills and knowledge of Mathematics teachers in SNE and MLD in particular.
2) The teachers should also promote one on one exchange with the pupils to enable corrective feedback that may also help to enhance the pupils' cognitive skills.

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Conflict of Interest Statement
I have no conflict of interest to declare.

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