



**AN EXAMINATION OF THE IMPACT OF THE TEACHER
QUALIFICATIONS ON MATHEMATICS ACHIEVEMENT
OF CLASS SIX PUPILS WITH DYSCALCULIA IN
MBEERE SOUTH SUB COUNTY, KENYA**

Christine Muthoni Njiru¹,

Jessina Muthee²ⁱ

¹Master's Student, School of Education,
Department of Special Needs Education,
Kenyatta University,
Nairobi, Kenya

²Lecturer, Dr.,
Department of Early Childhood and Special Needs Education,
Kenyatta University,
Nairobi, Kenya

Abstract:

Previous studies have noted that 10 children in every class of 40 pupils do not acquire mathematical numeracy in the sub-county. Further, among these pupils, those in class six achieved between 15% -18% in Mathematics subject. In this regard, it is expected that for inclusive education; teacher competency is considered a key determinant for mathematics achievement among class six learners with dyscalculia in Mbeere South Sub-County, Embu County. The purpose of this study was to examine the influence of teacher qualifications on the Mathematics achievement of class six pupils with dyscalculia. The study adopted a mixed method research adopting a descriptive survey design. The research was guided by the social developmental theory. The target population consisted of 378 pupils, 97 teachers from 14 primary schools, and 1 QASO officer, giving a total of 476. A simple random sampling technique was used to select a sample of 38 pupils, and 30 teachers, whereas purposive sampling was used to select the QASO officer. The main tools of data collection were: questionnaires and interviews. Piloting was done in one of the schools in the study area, which was omitted in the final study. Quantitative data realized from questionnaires were tallied, coded, and analyzed descriptively (means, frequencies, and percentages), with the aid of SPSS software, version 26. The study findings were presented in tables and diagrams. Qualitative data from the interview was edited, transcribed, coded, and analyzed thematically. Findings revealed that established the majority (60%) of class six mathematics teachers were well trained and therefore knowledgeable to teach pupils with dyscalculia. However, the

ⁱ Correspondence: email njuruchristine2@gmail.com, muthee.jessina@ku.ac.ke

majority (53.3%) of the teachers disagreed that they were not able to cope with pupils with dyscalculia while a further 53.3% disagreed that they have a negative perception of learners with dyscalculia. With 60% positive cases being greater than 54.4% negative cases, teacher qualifications, experiences, and abilities are considered to determine to a great extent mathematics achievement by class six pupils with dyscalculia. The study concluded that the teacher competencies determined to a great extent the mathematics achievement of class six pupils in Mbeere South sub-county. The study recommended that the school administrative body should ensure that there are enough teaching and learning resources to ensure a persuasive learning process in schools. This can be done with cognizance that government support may not always be adequate.

Keywords: teacher qualifications, mathematics achievement, class six pupils, and dyscalculia

1. Introduction

Education is thus viewed globally as a vital ingredient of the developmental process from both local and international perspectives as a powerful instrument for reducing poverty, gender inequality and for laying the foundation for sustainable economic growth (Benería, Berik, & Floro, 2015; ROK, 2005). Dyscalculia is neurological difficulty in processing information that severely limits a person's ability to calculate given arithmetic (Kron, 2023). In such a scenario, the brain does not process, understand, and use any Mathematical information making an individual pupil develop a mathematics learning disability (Nuraydin, Stricker, Ugen, Martin & Schneider, 2023).

In a population of 2.6 million in the USA in 2011, in every 8 learners, one was diagnosed with a Mathematics learning disability and received remedial education. 25% of students with learning disabilities in Mathematics in the same year in the USA dropped out of high school and only 61% of the enrolment completed high school and received a regular diploma (US National Centre for Education Statistics, 2011).

In Zambia, most schools in the country had an acute shortage of SNE teachers to offer Mathematics remedial classes in 2021 (Kangwa, 2022). This accounted for inefficient curriculum delivery and follow-up that resulted in poor performance in Mathematics in the year (Al Aid, 2023). It is thought to be both accessible and suitable to pay less consideration to mathematics learning disabilities (MLD) than to the need for a larger improvement in education (Roberts, Tshuma, Mpalami & Saka, 2019). Huge enrollments, inadequate utilization of textbooks, and the urgent need to enhance basic school facilities (clear water, clean drinking water, and electricity) all contribute to a lack of time and resources being allocated to identifying and treating math learning difficulties in individuals.

Kenyan Government has introduced a program called Strengthening Mathematics and Science Education (SMASE) to address the learning needs of learners with dyscalculia (Yusta, Muthee & Karugu, 2015). Nonetheless, 1512 primary school pupils

were assessed and were found to be experiencing learning disabilities in Mathematics in Mbeere South Sub-County (SCDE Mbeere South, 2012). The report further indicated that most pupils in class six achieved between 15 % to 18% in Mathematics in Mbeere South schools. This high number of low achievers in Mathematics has been the cause of dismal overall performance position 5/5 by the division perennially when it was ranked with others in the Sub-County. It was however noted in the same report that teacher competency influenced the variation of mathematics achievement by dyscalculia pupils. Failure to arrest this scenario will facilitate distraction of the achievement of the government's FPE expectations (Njoroge, 2022). This, in turn, would also subsequently place the division into a precarious bargaining position in terms of sharing the national resources and specifically economic development, considering that Mathematics is an industrial subject, hence the reason to establish whether teacher competency among other factors determines Mathematics achievement among class six learners with dyscalculia. Class six which lies in the middle of the upper primary was the one most affected and thus chosen as the focus of the current study. In this regard, it is hoped that for inclusive education, teacher competency determines Mathematics performance by pupils with dyscalculia in Kiritiri division, Mbeere South Sub-County.

1.2 Purpose of the Study

The purpose of this study was to examine the influence of the teacher qualifications on the Mathematics achievement of class six pupils with dyscalculia in Kiritiri division, Mbeere South Sub-County, Kenya.

1.3 Conceptual Framework

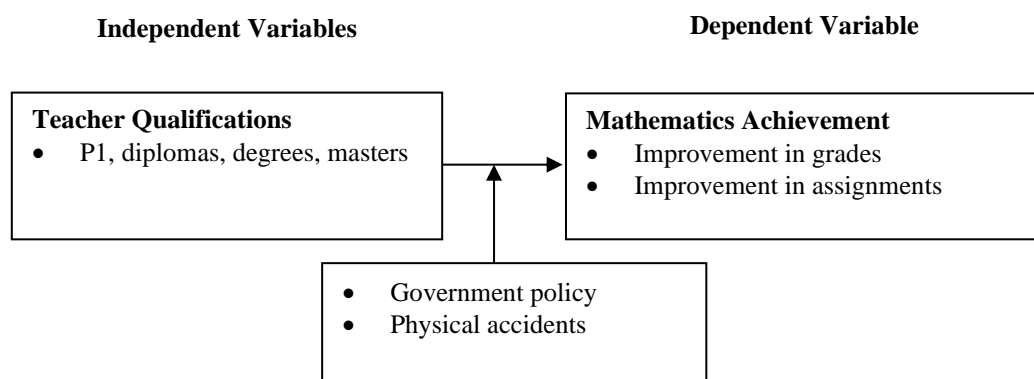


Figure 1: Conceptual Framework

2. Literature Review

This section discusses the theoretical framework and the literature related to the study topic.

2.1 Theoretical Framework

This study was guided by the social development theory of learning by Vygotsky (1978). The theory states that social interaction plays a fundamental role in cognitive development (Smolucha & Smolucha, 2021). The theory emphasizes the fact that the cognitive process develops through social interaction from learning mediated by the interaction between pupils and persons who are more knowledgeable. The principle of Vygotsky's social development theory is the impact of more knowledgeable others (MKO) and the zone of proximal development (ZPD) on learners (McLeod, 2022). MKO includes competent and skillful instructors (teachers) and adults who effectively impart education to pupils through social interaction.

The current study is based on social development theory because pupils with dyscalculia need an educator with appropriate competency in this case MKO. Regarding ZPD, pupils with dyscalculia highly depend on well-trained teachers for the management of remedial intervention mechanisms referred to as Individualized Education Programs (IEP). These remedial programs would close the ZPD gap that upgrades cognitive skills and therefore improve mathematics achievement of pupils with dyscalculia.

2.2. Teachers' Qualifications and Learners with Dyscalculia

Teaching is regarded as the process of imparting new knowledge, behaviour, skills, values, attitudes, and understanding that may involve synthesizing different types of information to a person (Redman & Larson, 2011; Westwood, 2008). Education officials also did not supervise quality education provision to pupils with dyscalculia by teachers as there is no special training for quality assurance officers on dyscalculia. The alternative argument raised was that many teachers did not realize that children with dyscalculia needed extra attention to cater to their differences while they had to work much harder than their peers to acquire, retain and perform academic and social skills daily (Cook, 2007; Jukes, Turner, Dubeck, Halliday, Inyega, Wolf, Zuilkowski, & Brooker). This would amount to overwhelming stress for dyscalculic pupils who have limited coping mechanisms that very often translate to behaviours that teachers may not understand or sometimes interpret the behaviour as rudeness (Carew, M. Deluca, Groce & Kett, 2019).

In Britain, teachers had negative attitudes towards pupils with dyscalculia because they required more contact time than other regular children. In Nigeria, the study by Eyo and Eme (2020) on teachers' competence in identifying pupils with learning disabilities noted that, although some primary school teachers were qualified to handle learners with learning disabilities, such qualifications were insufficient for practical use in class. In Kenya, a study by Ochieng, Kiplagat & Nyongesa (2017) in Migori, teacher educational qualification, teacher training, and experience determined teacher competency. Teacher qualification is measured by the teacher's understanding and mastery of Mathematical knowledge. They also found out that students gained a lot with well-educated teachers and that mathematics achievement worked well when the teachers had the standard certification. While studies by Ochieng, Kiplagat & Nyongesa focused more on teachers' competence in Mathematics performance in the KCSE examination and was done in

Migori, the current study will expand the knowledge gap by probing how teachers' qualification influence the achievement of Mathematics for class six pupils in Kiritiri division, Mbeere south Sub-County.

3. Methodology

3.1 Research Design and Target Population

The study adopted a mixed-method research approach and a descriptive survey design. This design was viable to the study because it allowed questionnaires and interviews to be easily subjected to a large population within a short time and thus gain information about the phenomenon under study (Mugenda & Mugenda, 2003). A descriptive research design provides the necessary information sought by the study in conformity with the research problem (Driscoll et al., 2007). The study targeted 378 class six primary school learners, 97 class six primary school mathematics teachers, and 1 QASO leading to a total target of 476 participants.

3.2 Sampling Technique and Sample Size

The study adopted a mixed sampling approach where a simple random sampling technique was used in selecting pupils, while purposive sampling was used in selecting teachers and the quality assurance and standards officer (QASO). Simple random sampling allows every item in the population an equal chance of being selected, hence creating an equal probability of selection (Kothari, 2004). Purposive sampling is preferred since it allows the researcher to rely on the judgment of respondents considered to hold crucial information for the study (Mugenda & Mugenda, 2003). The present study sampled 38 class six pupils (30% of the target) 30 teachers (30% of the target) and 1 QASO purposively selected.

3.3 Research Instruments and Data Collection

This section included a description of the instruments that were used in the study. Two instruments were used in the study namely: the questionnaires and interviews. Questionnaires were administered to teachers and QASOs officers while interviews were administered to standard six pupils. The questionnaires gathered information on teacher competencies constructs. On the other hand, the interview guide gathered information from the learners on teacher support given to pupils with dyscalculia.

The researcher visited the primary schools to make arrangements on the appropriate date for data interviews with the pupils, while the questionnaires were issued and collected within 1 month after administration. Questionnaires were distributed with the assistance of two research assistants, whose qualifications were coursework in masters and research methods specifically and who were trained in questionnaire management. Later, they were sent to collect to the field. On the interview day, permission was sought from the QASOs and the school heads for the interview proceedings where short notes were taken for compilation. For the young learners,

probing and interpretation were done where possible to ensure appropriate responses were recorded.

3.4 Pilot Study

A pilot study was done in one of the schools in the study area and was not considered in the final study. This was done by subjecting the questionnaires to 4 teachers and 10 class six pupils to examine the validity and reliability of the research instruments. The study used face validity to ensure a logical link between the questions in the research instrument and research objectives was established. This was achieved through consultations with the Kenyatta University Supervisor for feedback. Cronbach's alpha is a test of reliability that was generated and used to assess reliability. A reliability coefficient of >0.7 for all constructs was achieved thus making it acceptable.

3.5 Data Processing and Analysis

The quantitative data obtained from the Likert scale type were analyzed descriptively using frequencies and percentages. They were then presented using tables and charts. Qualitative data realized were coded and analyzed in an ongoing process and presented thematically. Statements that made meaning to the study were picked and then categorized accordingly and reports were written respectively to complement quantitative data. Overall, data were presented using tables and charts for easier interpretation and discussion of the study findings.

4. Results and Discussions

4.1 Demographic Information

The demographic information of the respondents included their gender of the respondents, age bracket, years working in the organization, designation, and the highest level of education. Out of 38 pupils who successfully took part in the study, 25 (66%) were males while 13 (34%) were females. Among the 10 teacher respondent, 6 were females whereas 4 were males. A total of 2 boys and 1 girl were identified to have dyscalculia among the 38 pupils sampled. Further findings indicated that of the teachers sampled, the highest proportion (40%) were aged between 31-50 years. A high proportion (50%) of the teachers had P1 qualifications, (30%) had undergraduate degree, while (10%) had master's qualifications. The majority (70%) of the teachers have been in a teaching career for 11 – 20 years. The findings are summarized in Table 2.

Table 1: Summary of demographic information

Variable		Frequency	Percentage
Pupils' gender	Male (boys)	25	66%
	Female (girls)	13	34%
Pupils with dyscalculia	Male (boys)	2	5.2%
	Female (girls)	1	2.6%
Teachers' age category	25 – 30 years	6	20
	31 – 40 years	12	40
	41 – 50 years	6	20
	Over 50 years	6	20
Teachers' years of experience	5 and below	3	10
	6 - 10	6	20
	11 – 15	15	50
	15 – 20	6	20
	Other	23	9.0%
Professional qualifications of teachers	Untrained	3	10%
	Certificate	15	50%
	Undergraduate	9	30%
	Masters	3	10%

4.2 Teacher's Qualification on Mathematics Achievement by Class Six Pupils with Dyscalculia

The first study objective was to examine the effect of teachers' qualifications on mathematics achievement among class six pupils with dyscalculia. To address this objective, respondents were presented with 6 items in which they were expected to rate their agreement levels on a five-point Likert scale ranging from strongly agree to strongly disagree. Table 2 shows the responses obtained.

Table 2: Effects of Teacher's Qualification

Item	SA		A		U		D		SD	
	F	%	F	%	F	%	F	%	F	%
Class six mathematics teachers are well-trained and have full knowledge of the meaning of dyscalculia	10	33.3	8	26.7	5	16.7	4	13.3	3	10.0
Class six mathematics teachers have long experience and are aware of the causes of dyscalculia	9	30.0	10	33.3	2	6.7	5	16.7	4	13.3
Class six mathematics teachers can identify pupils with dyscalculia in that class	9	30.0	8	26.7	4	13.3	4	13.3	5	16.7
Class six mathematics teachers do not set guidelines for appropriate classroom behavior for pupils with dyscalculia.	7	23.3	6	20.0	0	0.0	9	30.0	8	26.7
Class six mathematics teachers are not able to cope with pupils with dyscalculia	4	13.3	5	16.7	5	16.7	7	23.3	9	30.0
Class six mathematics teachers dislike pupils with dyscalculia	4	13.3	5	16.7	5	16.7	7	23.3	9	30.0

Key: Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), Strongly Agree (SA)

Table 2 shows that the majority of respondents strongly agreed or agreed that the teachers are well trained and have adequate knowledge to be able to teach class six learners (60%). The finding agrees with the findings of (Bett, 2016) that continuous professional development among primary school teachers has improved and that this has a positive effect on how teachers handle classroom learning. Teacher respondents also strongly agreed and agreed that class six teachers have adequate experience and awareness to be able to handle pupils with dyscalculia (63.3%). This finding is affirmed by the study of (Jukes et al., 2017) who noted that teacher professional development courses strengthen teacher capacities to teach not only humanities subjects but also science-based subjects such as mathematics. Further, 56.7% of teacher respondents strongly agreed and agreed that mathematics teachers can identify class six learners with dyscalculia. 56.7% of respondent teachers disagreed that teachers are not able to set guidelines for learners with dyscalculia, implying that on average, most teachers can, thus creating positive pupil support among those with dyscalculia.

The finding of Carew et al., (2019) on inclusive education in Kenya to enable teachers to cater appropriately to the needs of all learners, provides concurrence with the current study finding, though our result shows an average performance where 53.3% of the respondents strongly disagreed and disagreed that mathematics teachers are not able to cope with pupils with dyscalculia. This offered an indication that teachers' qualifications attained through training enabled them to achieve a lot in supporting mathematics achievement among learners with dyscalculia. This was also observed by (Kithuka, 2008) who noted that adequate exposure to dyscalculia by the teacher at the point of pre-service training coupled with a long experience enables the teacher to deliver mathematics concepts effectively to pupils with dyscalculia. Findings further showed that 53.3% of teachers appreciate learners with dyscalculia and offer them the necessary support to cope with mathematics subjects. Moreover, teacher effectiveness in managing pupils with dyscalculia should be regarded not as a stable characteristic of the teacher as an individual but as a product of the interaction between certain acquired teacher characteristics and other factors which vary according to the situation in which the teacher performs (Eyo & Eme, 2020; Odongo et al., 2016).

5. Conclusions

Requisite qualification and were able to identify learners with dyscalculia in their classrooms. This is considered to positively influence learner's mathematics achievement. Based on the findings above, the study concludes that the teacher competencies determined to a great extent the mathematics achievement of class six pupils in Kiritiri division, Mbeere South sub-county.

6. Limitations of the Study

The researcher encountered quite several challenges related to the research and most particularly during the process of data collection. Due to inadequate resources, the

researcher conducted this research under the constraints of finances. Some respondents were biased while giving information due to reasons such as possible victimization in the event the research findings turned sour. The current study was delimited to primary schools and thus could not be generalized. A similar study may be conducted in Secondary schools to find out whether the same findings would be replicated. Apart from the aspect of teacher's competency as the key scope of the study, other aspects like attitudes could be of importance but were not covered. Further research should be conducted on factors determining the pupils' attitudes towards mathematics performance by pupils with dyscalculia in other levels of study. Socio-cultural factors determining mathematics achievement of class six pupils with dyscalculia can be further examined to assess the extent of its influence on mathematics achievement among pupils with dyscalculia.

7. Recommendations

- The school administrative body should ensure that there are enough teaching and learning resources to ensure a persuasive learning process in schools. This can be done with cognizance that government support may not always be adequate.
- Teachers should strive to enroll in continuous in-service training to improve their content mastery and pedagogical skills to be conversant with the tailor-made changing curriculum delivery demands to deliver mathematics content not only to pupils with dyscalculia but also to mainstream pupils.

Acknowledgement

First, I thank the Almighty God for the far He has brought me. I wish to register my sincere appreciation to my supervisor Dr. Jessina Muthee, for the support and guidance she offered throughout the course of developing this project.

I also appreciate my readers; Dr. Abuom and Dr. Yattani for the guidance offered. I acknowledge Dr. Kiptum, Dr. Molly Ogalloh and Dr. George Mathenge in a special way for their scholarly input. Not forgetting to register my sincere thanks to all the Kenyatta University lecturers and Kenyatta University fraternity as a whole for the knowledge and skills they imparted in me. I also sincerely thank Mr. and Mrs. Joseph Maina, Mr. John Kibuchi, Abraham, Rose, Jackline, Edith, Judy, Mary, Gachoki and Blessed computers for their immense support. Special thanks goes to Mary Gitata for the effort she made towards this work.

Finally, I appreciate most sincerely my family especially dad; Mr. Mwangarie, mum; Hon. Ann Lily, daughter Megan, niece Quinter, nephew Adams and sister Millicent for their endurance, moral and monetary support throughout the period. Indeed, you were my shoulders to lean on.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Author(s)

Christine Muthoni Njiru is a teacher Kanothi Primary school in Mbeere South Sub-County, Embu County. She is a Master's Degree holder in Special Needs Education (Learning Disabilities) at the Department of Early Childhood and Special Needs Education in the school of Education Kenyatta University, Kenya. Her hobby is advancing in research of learners with learning disabilities.

Dr. Jessina Muthee is lecturer in the School of Education at the Department of Early Childhood and Special Needs, Kenyatta University, Kenya.

References

- Al Aid, W. A. (2023). The Level of Semantic Memory among Students with Learning Difficulties. *Journal of Namibian Studies: History Politics Culture*, 33, 2768-2787.
- Aro, T. & Timo, A. (2011). *Assessment of Learning Disabilities Cooperation between Teachers Psychologists and parents*. Finland: University of Turku.
- Benería, L., Berik, G., & Floro, M. (2015). *Gender, development, and globalization: economics as if all people mattered*. Routledge.
- Kangwa, E. (2022). *Remedial education in the teaching and learning of social studies: an examination of its effectiveness in selected junior secondary schools of Mongu district* (Doctoral dissertation, The University of Zambia).
- Mcleod, S. (2022). Vygotsky's sociocultural theory of cognitive development. Retrieved from *Simply Psychology*: <https://www.simplypsychology.org/Vygotsky.html>.
- Mugenda, O. M., & Mugenda, A. G. (2003). *Research methods: Quantitative & qualitative approaches* (Vol. 2, No. 2). Nairobi: Acts Press.
- Njoroge, G. (2022). Demystifying Mathematics: handling learning difficulties in Mathematics among low achievers in Kenyan schools. *Journal of Language, Technology & Entrepreneurship in Africa*, 13(1), 75-96.
- Nuraydin, S., Stricker, J., Ugen, S., Martin, R., & Schneider, M. (2023). The number line estimation task is a valid tool for assessing mathematical achievement: A population-level study with 6484 Luxembourgish ninth-graders. *Journal of Experimental Child Psychology*, 225, 105521.
- Roberts, N., Tshuma, L., Mpalami, N., & Saka, T. (2019). Mathematical learning and its difficulties in Southern Africa. *International Handbook of Mathematical Learning Difficulties: From the Laboratory to the Classroom*, 231-251.
- Smolucha, L., & Smolucha, F. (2021). Vygotsky's theory in play: early childhood education. *Early Child Development and Care*, 191(7-8), 1041-1055.
- The U.S. National Centre for Education Statistics (2011). *Digest of Education Statistics, 2010*. Washington D.C.: NCES.

- Uwezo & Hivos Twawezo (2012). Uwezo Report – Numeracy and Literacy across East Africa. Data collected by John Mugo. Retrieved on 18th December 2013 from <http://www.vijana.fm/2011/07/04/East-africa-report>.
- Waweru, J. W. (2018). *Influence of Teacher Preparedness on Implementation of Competency-Based Curriculum in Public Primary Schools in Nyandarua North Sub-County, Kenya*. Retrieved from <http://erepository.uonbi.ac.ke/handle/11295/104562>
- Westwood, P. S. (2008). *Teachers need to know about learning difficulties*. Australia: Acer Press.
- Yusta, P. (2015). *Impact of instructional resources on Mathematics performance of learners with dyscalculic in integrated primary school, Arusha city, Tanzania*. Unpublished Med. KU.

Creative Commons licensing terms

Authors will retain the copyright of their published articles agreeing that a Creative Commons Attribution 4.0 International License (CC BY 4.0) terms will be applied to their work. Under the terms of this license, no permission is required from the author(s) or publisher for members of the community to copy, distribute, transmit or adapt the article content, providing a proper, prominent and unambiguous attribution to the authors in a manner that makes clear that the materials are being reused under permission of a Creative Commons License. Views, opinions and conclusions expressed in this research article are views, opinions and conclusions of the author(s). Open Access Publishing Group and European Journal of Special Education Research shall not be responsible or answerable for any loss, damage or liability caused in relation to/arising out of conflict of interests, copyright violations and inappropriate or inaccurate use of any kind content related or integrated on the research work. All the published works are meeting the Open Access Publishing requirements and can be freely accessed, shared, modified, distributed and used in educational, commercial and non-commercial purposes under a [Creative Commons Attribution 4.0 International License \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/).