

K-12 Namibian teachers' beliefs on learning difficulties in mathematics: Reflections on teachers' practice

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This paper explores K-12 Namibian mathematics teachers' beliefs on difficulties associated with learning mathematics in school and examines their perceptions of problems affecting Mathematics Learning Difficulties (MLD). 231 teachers (100 primary and 131 secondary teachers) completed the survey. The findings reveal that teachers frequently frame students' difficulties within a deficit framework seeing students' difficulties as emanating from cognitive disabilities. Teachers' identification of potential causes of MLD is discussed. The paper concludes by considering the pedagogical implications of providing additional support to students with MLD and by providing recommendations for future research on changing teachers' negative perceptions towards students with MLD to optimize students' performance.

Keywords: Learning difficulties, teachers' perceptions, mathematics learning difficulties, beliefs.

Introduction

Many countries across Africa have reported poor mathematics performance among their students (International Mathematics Union Report, 2014). According to the Organization for Economic Co-Operation and Development (OECD), mathematics becomes a stumbling-block for the majority of students (OECD, 2014). In Namibia, like many other countries, mathematics is a compulsory subject in the K-12 curriculum because of its significance and practical value in everyday applications (Tjikuua, 2000). However, in the last three decades, since Namibia's independence in 1990, majority of students perform poorly in mathematics. Literature on mathematics education highlighted numerous factors leading to poor performance including students' difficulties in learning mathematics (e.g. Siyepu, 2013). To better understand students' difficulties in Namibia from the teachers' perspective, this study examines Namibian mathematics teachers' perceptions on Mathematics Learning Difficulties (MLD) and challenges experienced in teaching students with learning difficulties. Preliminary research shows that little is known about Namibian mathematics teachers' perspectives on MLD, rather past studies have focused on learning and teaching of specific content in mathematics, instead of understanding MLD. Therefore, the study's aim is twofold: contribute to the research on mathematics teachers' beliefs and mathematics education in terms of how teachers cater diverse learning needs of students with MLD and suggest potential ways for teachers' intervention starting by changing teachers' beliefs to improve the academic performance of Namibian students.

Theoretical background

Mathematics education researchers describe MLD in different ways. Morgan, Farka and Wu (2009) associate MLD to risks in mathematics proficiency. Karagiannakis, Baccaglioni-Frank and Papadatos (2014) describe MLD as a variety of obstacles that lead to difficulties in processing numbers. While some researchers claim that MLD is the result of sociocultural norms around developing

mathematical skills or comprehending arithmetic relations (Kaufmann & von Aster, 2012, p. 767), other researchers assert MLD is related to cognitive functions (Mazzocco, 2007). All students with MLD work slowly in mathematics (Wang, Du, & Liu, 2009) and perform poor academically (Jitendra et al., 2013). Building on the previous literature, this study considered MLD as any limitations or constraints that are believed have negative effect on students' achievement, and leads to difficulties in learning and poor performance of mathematics.

Several reasons and factors that might cause the learning problems in teaching students with MLD have been identified, including poor foundation in content knowledge, unwillingness to learn, and teachers' incompetency (Siyepu, 2013). The literature also reveals several causes that teachers attribute to mathematical difficulties, which include the lack of student motivation and the medium of instruction (Wang et al., 2009; Siyepu, 2013). Students tend to develop positive attitudes towards mathematics in early grades; however, some lose interest in mathematics as they move to higher grades (Lee, 2009) and experience difficulties in mathematics and perform poorly due to lack of interest in the subject (Tella, 2007).

To address the needs of students with MLD, Torbeyns, Verschaffel, and Ghesquire (2004) suggest that teachers pay special attention to effective teaching techniques at a slower pace, as this will improve student performance. However, such implementation requires understanding teachers' perspectives of MLD which has not been investigated before. Thus, this study explores Namibian teachers' beliefs about the difficulties associated with learning mathematics and how they perceive MLD. The perceptions of teachers are important in the identification of difficulties and factors involved in MLD and ultimately have a significant influence in changing practices (Kasanda, 2015) towards a more inclusive mathematics teaching.

Mathematics teachers' beliefs and practice

Mathematics teachers have a wide set of beliefs regarding mathematics content and the nature of mathematics, but also on effective teaching and learning of mathematics. These beliefs are often based on a teacher's own knowledge base, or his or her own experiences acquired through his or her adapted teaching practice (Maab & Schlöglmann, 2009). This study has adopted the definition of beliefs from Ajzen and Fishbein (1980), who define beliefs as whatever a person regards as true in a certain situation. These beliefs include thoughts, attitudes and principles adopted by individuals through a shared environment. Researchers on mathematics teachers' beliefs agree that beliefs play a critical role in determining how teachers teach and what they do (Thompson, 1992). Research also suggests more studies on beliefs on teaching and learning mathematics as well mathematics itself as a subject (Perry, Tracey, & Howard, 1999, p. 39). Also, Haser and Star (2009) suggest more belief studies are needed in different educational contexts to better understand how teachers deal with different situations. The present paper extends the work of Perry (1970), who explored mathematics teachers' epistemology beliefs – whereby the study will look at beliefs based on the experiences of teaching students with MLD to determine their notion of an inclusive setting. This perspective acknowledges that the personal beliefs of teachers might influence their teaching practice. According to Ernest (1991), a teacher's perspective is an individual belief system about the nature of mathematics. Ernest (1991) further found that mathematics teachers' perspectives, which are regarded

as beliefs or thoughts, influence a teacher's social context of teaching and the level of teacher's thought. Furthermore, educational researchers emphasize that teachers' beliefs and the social context affect the nature of how mathematics is taught or learned (Ernest, 1991). Thus, educational programs need to reshape those beliefs that may hinder effective mathematics teaching (Maasepp & Bobis, 2015). Researchers suggest that teachers' beliefs regarding teaching and learning affect their own practices (Thompson, 1992). It has been found that there is a strong relation between teachers' perspective of teaching and their perspective of students' mathematical knowledge (Sosniak, Ethington, & Varelas, 1991). Ernest (1991) concluded that to change the nature of teaching and learning of mathematics, changes in a teacher's belief structure is needed, while acknowledging that belief change is difficult. On account of this, the present study intends to answer the following questions:

1. What are Namibian mathematics teachers' beliefs about mathematics learning difficulties?
2. What challenges do mathematics teachers experience when teaching students with mathematics learning difficulty in an inclusive classroom and what potential measure do they use?

Methodology

Instrument

A survey with closed (teaching experience, education background) and open-ended questions (Kelley, Clark, Brown, & Sitzia, 2003), was administered, to get the perspectives of mathematics teachers' on MLD by asking the following questions: (i) What do you understand by 'learning difficulties' in mathematics? (ii) What challenges do you experience in teaching students with learning difficulties in mathematics? (iii) How do you deal with such challenges? The instrument also collected information on teachers' views about challenging topics to students as well as their estimation on difficulty among mathematics students as they move from primary to secondary level which are not reported in this paper because of limited space. The design process followed the recommendation of Zhanga and Zhou (2016) about the design of the questionnaire, that it should allow participants flexibility to provide rich data. The survey was designed by the author and revised by two experienced researchers in the field in terms of wording as well as its content for validity.

Participants and procedure

A total of 231 primary and secondary (100 and 131 respectively) teachers voluntarily completed the survey. Participants' teaching experience ranged from one to twenty years, and their educational backgrounds varied. Only five of the participants did not have the minimum teaching requirements, a diploma as per Namibian teaching requirements, and the majority taught at rural public schools.

The survey was given to teachers during an annual Namibian mathematics teachers' congress in 2017 where 232 teachers teaching at both primary and secondary phases participated. This congress is a venue where mathematics teachers across the country come together to share their experience and challenges encountered in teaching mathematics. This was a better platform for the author to obtain representatives from all fourteen educational regions to contribute to the study. Permission to conduct the survey was obtained from the conference coordinator. Teachers were briefed about the research objective and they were informed that their participation was anonymous and confidential. Teachers

were told to base their answers to what they experienced. Completion of the survey was done at the same time, about 30 minutes. One hundred and six teachers opted to submit the survey through Google Drive while one hundred and twenty-five placed the surveys in a drop box that was allotted for this purpose at a conference venue.

Data analysis

Responses to closed-ended questions were for comment on participants' background information. A qualitative approach was most appropriate to understand and interpret the data of the study, which were the respondents' answers to the open-ended questions. Data were analyzed using a thematic analysis (Ritchie & Lewis, 2003) based on the research questions mentioned earlier. According to Braun and Clarke (2006), descriptive themes enhance meaningful insights of data with deeper understanding. Every individual statement was considered for data analysis and all related features of the data were coded after data familiarization. Key words used in coding include "disabilities", "unable", "less ability", "lack of interest", and "struggling". Categories were identified and refined to make descriptions of the data understandable. The coding process generated three themes. Some of the descriptions are illustrated as direct quotes to support claims and to have a coherent conclusion.

Findings and discussions

The findings reveal that teachers have a wide range of beliefs. In general, the study reveals that teachers' beliefs illustrate that they are unaware of the causes of MLD. Three themes emerge from this study: Difficulties as the result of learning competency, students' low interest in mathematics, and insufficient mathematics learning foundation. However, this paper will only address competency in learning and students' low interest in mathematics.

Difficulties as a results of learning competency

The most interesting and emergent finding is related to teachers' perceptions on students' ability to learn mathematics. Data analysis showed that Namibian teachers are pessimistic about the ability of students to learn mathematics. They believed that students are unable to perform, they cannot learn in certain settings, or that students' potential to learn mathematics is limited. These teachers' perceptions revealed that Namibian teachers tend to associate MLD to a student's cognitive ability. These beliefs are shared by Mazzocco (2007) in her study as she described that student's ability to learn mathematics is cognitive-based, focused on what students cannot do, instead of what they can do or know. This belief is illustrated by the data, which identifies common key words in the data set, such as: "unable", "inability", "lack", "slower", "struggle", "not achieve", "cannot do", "not able", "poorly", "obstacles", or "hardly catch up". The analysis indicates Namibian teachers consider students to have learning difficulties if they cannot acquire certain skills or have difficulties meeting the learning objectives. Similar findings were addressed by Wang et al. (2009), where teachers stated that students with MLD develop a poor sense of numbers, they have low competency in learning mathematics and need individual support. Moreover, the data report that students with MLD are hardly able to catch-up as they exhibit disabilities when trying to meet the required skills and are unable to function at base level. One teacher reported that, "students struggle[d] to use acquired mathematics skills." While another teacher who based his/her remarks on student arithmetic skills

stated that, “learners demonstrate slow or inaccurate recall of basic arithmetic facts”. Teachers’ beliefs about MLD are illustrated below:

These are challenges that learners face in the classroom setting which contribute [...] to poor performance and misunderstanding of mathematics [...]. Remedial is needed.

I consider a learner to have learning difficulties if they cannot acquire certain skills or have difficulties meeting the learning objectives.

As illustrated in the above quotations, teachers’ perceptions indicate that MLD are regarded as problems that hinder a students’ learning process, they negatively affect students’ academic performance, and consequently cause students to perform poorly in mathematics. Teachers further disagree on the performance levels of students in relation to the competency to be achieved at a certain stage or level. Teachers believe students with MLD cannot master the skills one is expected to attain at a certain level or in a certain learning area. Hence, one teacher mentioned additional learning support for students with MLD:

... [If a] learner is unable to master 40% of the competencies a learner will need special attention apart from [the] normal allocated time for the period. So, such a learner will be given some extra classes for improvement.

Further, majority of teachers reported that by offering a variety of teaching methods, students with MLD could improve their performance in mathematics. Teachers’ seem to believe that not only students with MLD experience difficulty, but even the gifted ones, too. They believe that every individual has some specific learning difficulties, as reported in the previous studies (Eisenberg, 2002). Further, the identification of learning support strategies was helpful in improving student performance across the board. This indicates that learning support can be explored to remedy challenges facing students with MLD as stated below:

With learning difficulties, I do understand that not only the slow learners experience learning difficulties, but the gifted learners can also experience learning difficulties [and ...] compulsory teaching/support can remedy the situation.

Another teacher who stressed the use of learning support materials reported that she used array of teaching methods, including the use of, “concrete materials, remedial teaching and learning support, games [...], opportunities to work together and practical examples.” These examples would require a demonstration of the correction between those techniques/methods and higher student performance. Moreover, a handful of participants believed that regular learning activities and those that accommodate all student abilities might improve overall student performance.

Students’ low interest in mathematics

Additionally, the survey results indicate that teachers believe learning difficulties are associated with a student’s low interest in the subject. Mathematics education literature stresses that the promotion of students’ interest enables greater student success (Hulleman & Harackiewicz, 2009). The data analysis reveal that MLD is often identified to be the cause when students are “not academically good” in mathematics, as a results of “low enthusiasm” in the subject. Findings indicate that students with MLD “lose interest” in the subject, are considered “not serious,” and “usually [do] not participate

in math class.” However, teachers report that despite learning difficulties, some of these students are willing to learn mathematics, particularly if they receive support, and are given positive reinforcement. These responses are similar to those reported by (Zakaria, Chin, & Daud, 2010) as they found that, individual students’ needs should be supported with effective teaching and learning. As one teacher reported, “these are learners who are willing to learn but they have difficulties in the learning process.” As another teacher stated, students with MLD need positive reinforcement, so for “those who lose interest, [that teacher...] gave them positive feedback.” Similarly, another teacher said, “I used to buy them sweets when they did better in a test and also do remedial teaching in the afternoon.” This shared belief by teachers was summarized by another teacher:

Learners must be encouraged by means of positive feedback, such as ‘very good,’ ‘excellent,’ [or] ‘you are doing well.’ Learners [...] experience success by giving them classwork and by giving them immediate feedback. The more success learners [...] experience, the more they become confident and hence learning will take place.

Conclusions and future perspectives

The survey results show that the personal beliefs of the participants may have a negative influence on their teaching practices related to students with MLD. According to the personal beliefs of the participants, and Karagiannakis et al. (2014), mathematics learning difficulties are seen as obstacles that hinder the learning of mathematics, including learning environments and social contexts. Participants indicated they believe these obstacles result in shortcomings in mathematics comprehension, and result in a student’s inadequate development of a mathematics foundation in certain topics or the subject area as a whole. According to the findings, Namibian teachers also believe that MLD delay the learning process and negatively affect students’ academic performance. Responsive statements from the survey show that some of the negative views teachers had might affect their perceptions of students with learning difficulties, and have the potential influence their teaching process (Kasanda, 2015; Thompson, 1992). Further, the majority of participants frame learning difficulties to intellectual aptitude but they did not connect these beliefs to lack of interest or lack of math knowledge though it is mentioned in the literature (Siyepu, 2013; Tella, 2007). Thus, to improve performance outcomes for students experiencing MLD, there is a need of belief change among mathematics teachers, as suggested by Ernest (1991). However, the question remains: How to change teachers’ negative perceptions towards students with MLD? This could be a direction for future research in order to optimize the current study’s outcomes. Furthermore, problems persist as identified by teachers for students with MLD, as these students not only perform poorly in the classroom, but they present low participation and demonstrate little interest in the subject, among others factors. Yet, the majority of Namibian teachers, participated in this study believe that MLD result from an inadequate mathematics foundation, as stressed by Siyepu (2013). However, this current study shows negative connotations of students with MLD, though they may acquire mathematics skills through extra learning support as highlighted in the findings.

References

- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Eisenberg, T. (2002). Functions and associated learning difficulties. In D. Tall (Ed.), *Advanced mathematical thinking* (pp. 140–152). Dordrecht, The Netherlands: Springer.
- Ernest, P. (1991). *The philosophy of mathematics education*. Hampshire, United Kingdom: The Falmer Press.
- Haser, Ç., & Star, J. R. (2009). Change in beliefs after first-year of teaching: The case of Turkish national curriculum context. *International Journal of Educational Development*, 29(3), 293–302.
- Hulleman, C. S., & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. *Science*, 326(5958), 1410–1412.
- International Mathematical Union report (2014). Mathematics in Africa: challenges and opportunities. Retrieved July 30, 2017, from https://www.mathunion.org/fileadmin/CDC/cdc-uploads/CDC_MENAO/Africa_Report.pdf
- Jitendra, A.K., Rodriguez, M., Kanive, R., Huang, J., Church, C., Conroy, K.A., & Zaslofsky, A. (2013). Impact of small-group tutoring interventions on the mathematical problem solving and achievement of third-grade students with mathematics difficulties. *Learning Disability Quarterly*, 36(1), 21–35.
- Karagiannakis, G., Baccaglini-Frank, A., & Papadatos, Y. (2014). Mathematical learning difficulties subtypes classification. *Frontiers in Human Neuroscience*, 8(57), 1–5.
- Kasanda, C. D. (2015). Provision of mathematics continuous professional in Namibia. *International Journal of Educational Sciences*, 8(1), 189–197.
- Kaufmann, L., & von Aster, M. (2012). The diagnosis and management of dyscalculia. *Deutsches Ärzteblatt International*, 109(45), 767–778.
- Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care*, 15(3), 261–266.
- Lee, J. (2009). Universals and specifics of math self-concept, math self-efficacy, and math anxiety across 41 PISA 2003 participating countries. *Learning and Individual Differences*, 19(3), 355–365.
- Maab, J., & Schlöglmann, W. (2009). *Beliefs and attitudes in mathematics education. New research results*. Rotterdam, The Netherlands: Sense Publishers.
- Maasepp, B., & Bobis, J. (2015). Prospective Primary Teachers' Beliefs about Mathematics. *Mathematics Teacher Education and Development*, 16(2), 89–107.

- Mazzocco, M. (2007). Defining and differentiating mathematical learning disabilities and difficulties. In D. Berch & M. Mazzocco (Eds.), *Why is math so hard for some children? The nature and origins of mathematics learning difficulties and disabilities* (pp. 29–47). Baltimore, MD: Paul H. Brookes Publishing.
- Morgan, P. L., Farka, G., & Wu, Q. (2009). Five-year growth trajectories of kindergarten children with learning difficulties in mathematics. *Journal of Learning Disabilities*, 42(4), 306–321.
- OECD (2014). Education indicators in focus. Retrieved July 30, 2017, from [http://www.oecd.org/education/skills-beyond-school/EDIF%202014--N22%20\(eng\).pdf](http://www.oecd.org/education/skills-beyond-school/EDIF%202014--N22%20(eng).pdf)
- Perry, B., Tracey, D., & Howard, P. (1999). Head mathematics teachers' beliefs about the learning and teaching of mathematics. *Mathematics Education Research Journal*, 11(1), 39–53.
- Perry W. G. (1970). *Forms of intellectual and ethical development in the college years*. New York, NY: Holt, Rinehart and Winston.
- Ritchie, J., & Lewis, J. (2003). *Qualitative research practice*. London: Sage Publication.
- Siyepu, S. (2013). The zone of proximal development in the learning of mathematics. *South African Journal of Education*, 33(2), 1–13.
- Sosniak, L. A., Ethington, C. A., & Varelas, M. (1991). Teaching mathematics without a coherent point of view: Findings from the IEA Second International Mathematics Study. *Journal of Curriculum Studies*, 23(2), 119–131.
- Tella, A. (2007). The impact of motivation on student's academic achievement and learning outcomes in mathematics among secondary school students in Nigeria. *Eurasia Journal of Mathematics, Science & Technology Education*, 3(2), 149–156.
- Thompson, A. G. (1992). Teachers' beliefs and conceptions: A synthesis of research. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 127–144). New York, NY: Macmillan.
- Tjikuua, C. (2000). *Science education reform in Namibia*. Washington, DC:World Bank.
- Torbeyns, J., Verschaffel, L., & Ghesquiere, P. (2004). Strategic aspects of simple addition and subtraction: The influence of mathematical ability. *Learning and Instruction*, 14(2), 177–195.
- Wang, G., Du, H., & Liu, Y. (2009). Case study on improving high school students with learning difficulties in mathematics. *Journal of Mathematics Education*, 2(2), 122–133.
- Zakaria, E., Chin, L. C., & Daud, M. Y. (2010). The effects of cooperative learning on students' mathematics achievement and attitude towards mathematics. *Journal of Social Sciences*, 6(2), 272–275.
- Zhanga, Y., & Zhou, X. (2016). Building knowledge structure by testing helps children with mathematical learning difficulty. *Journal of Learning Disabilities*, 49(2), 166–175.