Practices of learner-centred Mathematics curriculum in senior secondary schools in the Khomas Region

Author: H. M. Kapenda
Faculty of Education, UNAM

Abstract

This article is part of a larger study that investigated how secondary schools Mathematics teachers in the Khomas region are implementing Learner-Centred Education in their classrooms. It presents a qualitative research that involved eight weeks of fieldwork investigations. Three Mathematics classrooms were selected from three different schools in the Khomas Region. Using a video camera, classroom observations were carried out in order to capture maximum classroom activities and participation of both the teacher and the learners. The teachers were interviewed after lesson observations. The results revealed different types of classroom interactions in the three classrooms. These include among others, question and answer dialogue between the teacher and the learners; teachers giving instructions; learners asking for clarification, just to mention but a few. The findings suggested that Mathematics teachers at Senior Secondary schools used the expository method more often in their teaching than other teaching methods such as lecturing and discussions. The teachers also used the chalkboard quite frequently, especially when assigning class activities. However, the teachers endeavoured to implement Learner-Centred approaches in their teaching.

Background

The educational reform in Namibia prior to independence (around 1986) proposed pedagogical changes in the classrooms, namely the introduction of Learner-Centred approach. To advocate and promote this new reform, several

projects such as, the Integrated Teacher Training Programme (ITTP), the In-Service Training and Assistance to Namibia Teachers (INSTANT) and the Basic Education Teacher Diploma (BETD) were introduced respectively. In 1993, Namibia embraced the idea of Learner Centred Education (MEC, 1993; Angula and Grant-Lewis, 1997) as the framework for curriculum and teaching at all levels of primary and secondary schooling. This major innovation was an attempt to move away from the subject-centred curriculum and teacher-centred teaching that had characterized education during the colonial period (Tabachnick, 1998). Thus, the 'new' teaching method (learner-centred) would address the inequalities of the past, ensure a quality and democratic education and provide equity among the Namibian learners (MEC, 1993). However, Namibia has not fully recovered from the colonial malpractices, especially in mathematics education. A Task Force on 'Improving Mathematics in Namibia' (23-27 September 2002) reports that irrespective of "projects, papers written, and research carried out in mathematics and mathematics education… there has not been a great deal of improvement resulting from these efforts; learners still under-achieved in mathematics" (Namibia Human Resource Development Programme (NHRDP, 2002: 3). This article therefore reports on some of the findings from the main study carried out in 2008.

Theoretical framework

The theoretical framework of this study draws on the following directions of educational research, namely: Mathematics education and social constructivism. Specifically, emphasis is put on social constructivist ways of teaching in Mathematics classrooms. According to Van de Walle (1998, p.22) "Constructivism provides us with insights concerning how children learn Mathematics." Therefore, "Constructivist approach to teaching calls on teachers to be learners themselves, revealing how embedded within constructivist teaching experiences are continual opportunities for teachers to learn about students, about students learning, and about the very nature of the learning process itself " (Falk, 1996, p.22).

> Learner-Centred Education is, therefore, said to rely more on the theory of social constructivism, because social constructivism takes into account the social nature of the learning environment as a collaborative atmosphere between teachers and learners (Dougiamas, 1998; Hanley,

1994; Murphy, 1997 and Roesler, 2002). Roesler (2002) mentions that in a social constructivist classroom, learners play an active role because they are able to construct their own meanings, rather than just memorising and reciting the 'correct' answers. Roesler (2002, p.15) further highlights some of the elements that could represent a typical constructivist Mathematics classroom as follows:

- Exploration of real-world phenomena, possibilities and problems;
- Recognition for the role of patterning in understanding mathematical functions and application of Mathematics structures;
- Appreciation of the objectivity and utility of mathematics, as well as its fallibility and culture-boundedness;
- Emphasis on exploration; abundant use of manipulatives; simultaneous and varied activities; emphasis on small group work; little concern about time and flexibly arranged furniture.

Moreover, Jaworski (1994a, p.218) states that social constructivism is a philosophy that underpins much of what is regarded as good practice in Mathematics teaching and learning. However, the diverse and obscure nature of Mathematics (Goulding, 1997) could influence ways in which both teachers and educators approach the teaching of Mathematics. According to Jarworski (1994) and Ernest (1994), Mathematics as a subject allows learners the opportunity to construct their own knowledge and understanding. However, "Teaching Mathematics is difficult, particularly if it is based on a constructivist perspective" (Jaworski, 1994a, p.230). It is thus implied that it is not easy for Mathematics teachers to implement learner-centred approaches in their teaching.

Learner-Centred Education

The term Learner-Centred Education (LCE) has long been in existence in the education setting (Kapenda, 2007). Its origin could be traced back to the work of some of the well-known philosophers and educators such as Confucius, Socrates, Jean-Jacques Rousseau, Colonel Francis Parker, Pestalozzi, just

to mention but a few (Cuban, 1993 and Henson, 2003). According to Henson (2003), the history of LCE stands on two feet. It has one foot in the philosophy and the other in the psychology.

Henson (2003) speculates that the Chinese philosopher Confucius and the Greek philosopher Socrates (around the 5th and 4th centuries B. C.) were the earliest individual teachers to have intense and direct effect on Learner-Centred Education. Later on, around the 16th century, Johann Pestalozzi was influenced by Rousseau's writings and decided to open a school in Switzerland, with a Learner-Centred curriculum (Henson, 2003). Henson further writes that during that time Fredrick Froebel (in Germany) used the Learner-Centred, Child-Centred, and experience-based ideas to develop the world's first kindergartern. Centuries later, with the influence of diverse notions from various educators (such as John Locke's tabula rasa, Francis Bacon's scientific method, Immanuel Kant's pragmatism and others) John Dewey at the famous School of Education, University of Chicago, idealized the concept Learner-Centred Education to "embrace the idea that education should be both problem-based and fun" (Henson, 2003, p.3). Dewey further recognized that each child has both a psychological as well as a social dimension. Therefore, in opposition to Rousseau's idea of protecting children from the society, Dewey strongly believes that "the only way a child would develop to its potential was in a social setting" (Henson, 2003, p.3).

In general, the term Learner-Centred Education therefore embraces terms such as, active learning, exploration, self-responsibility, learners' prior knowledge and skills as well as the construction of knowledge rather than passive participation of students (American Psychological Association (APA), 1997; Edmund and Stephens, 2000; Fardouly, 1998; McCombs and Whisler, 1997; Norman and Spohrer, 1996; Rowell, 1995; Thompson, Licklider and Jungst, 2003; Walczyk and Ramsey, 2003 and Woelfel, 2004).

From a research-based perspective, McCombs and Whisler (1997) distinguish the concept Learner-Centred from child or student-centred by defining it as:

A perspective that couples a focus on individual learners (their heredity, experiences, perspectives, backgrounds, talents, interests, capacities, and needs) with a focus on learning (the best available knowledge about learning and how it occurs and about teaching practices that are most effective in promoting the highest levels of motivation, learning, and achievement for all learners) (p.9).

Van Harmelen (1998) differentiates between Learner-Centred and Child-Centred education by stating that:

In presenting the case for learner centred education as theoretically different from child centred education, I argue that child centred education is essentially linked to a particular perception of *childhood*, whereas learner centred education is concerned with *how learning occurs* and knowledge is acquired by all learners (p.3).

According to Entwistle (1974), child-centred education puts a lot of emphasis on the child as a *free* individual. He states: "The initial concentration of attention upon the child was a moral protest against the abuse of childhood; an outcry against treating the child as a means to an end..." (p.17). According to Brandes and Ginnis (2001), the other term 'Student-Centred Learning' was invented by Carl Rogers. They describe the term 'Student-Centred Learning' as "a system of providing learning which has the student at his heart" (p.1). The term 'Child-Centred education' is too radical in comparison to Learner-Centred Education. However, the term 'student-centred learning' has a closer meaning to the concept Learner-Centred Education. Both Learner-Centred and Student-Centred put a learner/student at the centre of learning.

In its document entitled *How learner centred are you*? the Ministry of Basic Education and Culture (MBEC) in Namibia, specifically defines the term Learner-Centred Education as:

An approach to teaching and learning that comes directly from the National Goals of equity (fairness) and democracy (participation). It is an approach that means that teachers put the needs of the learner at the centre of what they do in the classroom, rather than the learner being made to fit whatever needs the teacher has decided upon… learning must begin by using or finding out the learners' existing knowledge, skills and understanding of the topic…Then teachers develop more activities that build on and extend the learners' knowledge (MBEC, 1999, p.2).

The translation of the rhetoric into practical reality concerning Learner-Centred approach is ambiguous, because according to the Ministry of Basic Education and Culture (1999, p.3) it is further stated that "no lesson is ever completely Learner-Centred or Teacher-Centred …in one lesson, and a teacher might use different approaches for different dimensions." Therefore, teachers need to use their own discretion (for example, taking into account different dimensions

such as classroom set-up, teacher talk, content and lesson activities) in order to apply a Learner-Centred approach in their teaching. This situation could, therefore, be one of the causes that hinder proper implementation of Learner-Centred approaches in Namibian classrooms, because teachers tend not to know where to draw the boundaries between teacher-talk and Learner-Centred approaches.

Curriculum Concepts

The term 'curriculum' is used broadly by teachers and educators; hence different meanings are attached to it. According to Ornstein and Hunkins (2004, p.10), "Curriculum can be defined as a *plan* for action or a written document that includes strategies for achieving desired goals or ends." Ornstein and Hunkins also explain that this type of definition exemplifies a linear view of curriculum as opposed to the broad definition of curriculum that deals with the experiences of the learners. They further provide three distinct definitions of curriculum, namely: 1) Curriculum can be considered as a 'system' for dealing with people and the processes or the organization of personnel and procedures for implementing that system. 2) Curriculum can also be viewed as a field of study, comprising its own foundations and domains of knowledge, as well as its own research, theory and principles and its own specialists to interpret this knowledge. 3) Curriculum can be considered in terms of subject matter (Mathematics, Science, English, History etc.) or content (the way we organize and assimilate information (p.11). However, Ornstein and Hunkins (2004) caution that the last definition has no advocate because in most cases school systems have a tendency to develop curriculum in terms of different subjects and grades.

Graham-Jolly (2002, p.21) explains that "The term curriculum is often used to refer to the formal academic programme provided by a school, as reflected in subjects on the timetable…or to describe a course of study…" Creemers (1994, p.37) states that the term curriculum has been used over the years to indicate a variety of documents, especially in the European tradition. Creemers further mentions that, originally a curriculum was a term used to refer to a document at school, containing information about the time schedule, aims, objectives and methods. Later, the term curriculum was used for textbooks. Nowadays, other terms are introduced to distinguish documents at the different school levels (Creemers, 1994, p.37).

Kelly (1989; 2004) points out that the term 'curriculum' is used with several meanings and has many dimensions because of the different definitions that are attached to it. He therefore, distinguishes the use of the word either to denote the content of a particular subject (or area of study) or to refer to the total programme of an educational institution. Kelly (1989) further argues that, since most people still use the word 'curriculum' and 'syllabus' interchangeably, this perception limits their planning in terms of the content or the body of knowledge they wish to transmit. Kelly (1989), therefore, cautions that one should be aware of the limiting factors provided by the type of definition the term 'curriculum' is given because "it is likely to hamper rather than to assist the planning of curriculum change and development" (p.10).

According to Voigts (1998, p.1), the post-independence reform process in Namibia was initially spearheaded in the formal education sector by the development of new uniform curriculum in the Secondary school phase, followed by a reform of the primary education curriculum. However, curriculum reform (globally) is not static, it is an on-going process, because society is a dynamic entity that requires to be fed with new knowledge, skills and values (Voigts, 1998, p.5) Curriculum, therefore, needs to be revised now and then in order to meet the needs of the society at large. The extent to which the school curriculum is interpreted and implemented depends on how its different sections (parts) are understood and applied.

Research question

What is the *nature* of classroom teaching practices for a Learner-Centred Mathematics curriculum in Namibia?

Methods

This study presents a qualitative research that involved eight weeks of fieldwork investigations of secondary school Mathematics teachers' classroom practices. In order to understand the nature of classroom teaching practices, the researcher used a qualitative research design. Specifically' three Mathematics classrooms were conveniently selected and observed using the following criteria:

1. The school should be a senior secondary school because the emphasis of this study was on senior secondary schools.

2. The school should have a Mathematics teacher who is willing to work with me for a period of two to three consecutive weeks.

A video camera was used to record a total number of 22 Mathematics lessons at Grade 11. The video transcripts were transcribed verbatim and were used to describe the nature of Mathematics classroom teaching practices for a learner-centred approach. The teachers were interviewed after the observations were completed.

Results

In this study, the term '*nature* of classroom practice' is defined in the context of three attributes namely, *teacher*, *learner* and *classroom* to explain the interaction practices between the teacher and the learners and between the learners and learners themselves. Table 1 below summarizes these attributes.

Table 1: Nature of classroom practice for learner-centredness

Attributes	Characteristics
Teacher	Classroom management strategies. Teaching strategies or methods used. Interaction with learners.
Learner	Learners' dispositions such as responses to teacher requests and invitations to participate; doing tasks given to them; seeking further information on their own by initiating discussions; sharing information with peers.
Classroom	Seating arrangement. Adequacy of space. Appropriate resources that stimulate learners' interest.

Results of events in Classroom A

The interactions between the teacher and the learners and between the learners themselves in Classroom A revealed different types of classroom interactions as follows:

- Question and answer dialogue between the teacher and learners whereby the learners mostly gave chorus answers. In this case, negative utterances or affirmation answers in the form of 'yes' or 'no' answers were given.

- The teacher giving instructions to the class. (e.g., "take your handouts" or "come and do number 2 on the chalkboard").
- The learners asking for clarification or asking the teacher to explain more; the learners discussing the exercise(s) among themselves.
- The teacher reprimanding learners about homework matters or misbehaviour in the classroom.
- The learners explaining their work (mostly done on the chalkboard).
- The teachers asking follow-up questions, namely "positive five and negative three gives you what?"
- The teacher asking learners to give explanations; the teacher giving feedback (on homework or class work) to the class.

Results of events in Classroom B

The interactions between the teacher and the learners and between the learners themselves in Classroom B revealed the following types of classroom interactions:

- Question and answer dialogue between the teacher and the learners whereby the learners mostly gave chorus answers. In this case, negative utterances or affirmation answers in the form of 'yes' or 'no' answers were given.
- The teacher giving instructions to the class. (e.g., "hand in your books for marking" or "come and do number 3 on the chalkboard.")
- The teacher dictating the exercises; the teacher giving explanation or clarification on class activities; the teacher giving feedback (on homework or class work) to the class;
- The teacher asking learners to do class work or to explain their work (e.g., "explain why you did it like this?")
- The learners discussing the exercise(s) among themselves; the learners asking for clarification or explanations, (e.g., "Sir, why don't you use this formula she used?")
- The teacher reprimanding learners about homework matters.

Results of events in Classroom C

The interactions between the teacher and the learner and between the learners themselves in Classroom C revealed different types of classroom interactions as follows:

- Question and answer dialogue between the teacher and the learners whereby the learners mostly gave answers in turns, row by row. In this case, very brief answers in the form of 'one' or 'ten' were given.
- The teacher giving explanations on how to work out solutions; the teacher asking learners to work out solutions on the chalkboard or in their exercise books (giving instructions); the teacher asking follow up questions,(e.g., "I got here p and q. Why do I say that?")
- The teacher asking learners to pay attention.
- The teacher asking higher order questions. (e.g., "How did you get five as an answer?")
- The teacher asking the learners to explain their work; the teacher giving feedback on the work done; the teacher reading through the homework exercises.

In most cases, the teachers asked the learners to work solutions on the chalkboard. The learners in classroom B participated more than other learners in class A & C. They asked the teacher more challenging questions. This particular teacher was inexperienced (a new graduate). All three teachers used expository method i.e., they work out few examples first on the board then gave class activities. Table 2 below summarizes the activities and events carried out in the three classrooms.

Table 2: Summary of events in the classrooms

Lessons (L)	L1	L2	L3	L4	L5	L6	L7	L8
Classroom **A**	√ √ √ √√ √ √ √ √	** √√	*	* √√	** √√√	**	√	**

Classroom **B**	* * * x √√	* x	* * √ xxx	* * xx	* √ Xx	* xxx	* Xx	√
Classroom **C**	* x √√√	√ √ √ √√ xxxx * β	* * xx √√	* * √ √ xxx	 Xx	* √ √ β xxxx		

Key: * indicates class activities; √ indicates previous experiences; **β** indicates other subject areas; **x** indicates real-life experiences

From Table 2, one can see that Classroom C displays a reasonable amount of classroom events across the six lessons compared to Classroom B and A, respectively. The table also shows that the common practices among the three teachers are incidences of the teachers making references to the learners' previous experiences followed by the use of real-life examples. In most of the lessons that were observed, the teachers made reference to the learners' previous knowledge or experiences. Sometimes they also reminded the learners to recall previous Mathematics concepts and equations in order to work out solutions to certain problems. All the three teachers carried out one or two class activities in most of their lessons.

Conclusion

The nature of each Mathematics classroom influenced and affected (directly or indirectly) teachers' classroom practices in the implementation of LCE. From the interview sessions, the teachers were convinced that expository method is a good approach for teaching Mathematics. Specifically, the use of expository or exposition method has been noted to have rich and rewarding classroom experiences, as described by DES (1985) below:

> *Successful exposition may take many different forms... it challenges and provokes the pupils to think; it is creative to pupils' needs and so it exploits questioning techniques and discussions; it is used at different points in the process of learning and so, for example, it may take the form of pulling together a variety of activities in which the pupils have been engaged...* (DES, 1985 *cited in* Simmons, 1993, p.3).

The chalkboard was frequently used by the teachers especially when assigning class activities. In most cases, the learners were asked to work out solutions on the chalkboard or to write solutions in their exercise books. Two teachers used prepared handouts for the learners' exercises and the textbooks were mostly used as referrals for homework. It can thus be concluded that the Mathematics teachers attempted to implement Learner-Centred Education in their teaching.

References

Angula, N. and Grant-Lewis, S. (1997). Promoting democratic processes in educational decision making Reflections from Namibia's first 5 years. *International Journal of Educational Development*, 17 (3).

American Psychological Association (APA) (1997). *Learner-centred psychological principles: A framework for redesign and reform.* [Online]. Retrieved April 06, 2002, from http://www.apa.org/ed/lcp.html

Brandes, D. & Ginnis, P. (2001). *A guide to student-centred learning*. United Kingdom: Nelson Thornes Ltd.

Creemers, B. P. M. (1994). *The effective classroom*. London: Cassell.

Cuban, L. (1993). *How teachers taught: Consistency and change in American classrooms 1890-1990* (2nd ed.). London: Teachers College Press.

Dougiamas, M. (1998) *A journey into constructivism*. [Online]. Retrieved June 19, 2006, from http://dougiamas.com/writing/constructivism.html

Entwistle, H. (1974). *Child-centred education*. London: Methuen & Co LTD.

Ernest, P. (1994). *Constructing mathematical knowledge: Epistemology and mathematical education*. New York: The Falmer Press.

Falk, B. (1996). Teaching the way children learn. In M. W. Mclaughlin & I. Oberman (Eds.), *Teacher Learning: New policies, new practices*. New York: Teachers College press, Columbia University.

Fardouly, N. (1998). *Learner-centred teaching strategies*. [Online]. Retrieved May 30, 2002, from http://www.fbe.unsw.edu.au/learning/instructional design/strategies.htm

Goulding, M. (1997). *Learning to teach Mathematics*. London: David Fulton Publishers.

Graham-Jolly, M. (2002). The nature of curriculum. In J. Gultig, U. Hoadley & J. Jansen (Eds.), *Curriculum: From plans to practice: Reader*. Oxford: Oxford University Press.

Hanley, S. (1994). *On constructivism*. [Online]. Retrieved February 23, 2003, from http://www.inform.umd.edu/UMS+State/UMDProjects/MCTP/Essays/Constructivism.tx

Henson, K. T. (2003). Foundations for learner-centred education: A knowledge base. *Education*, 124 (1), 14-17. [Online]. Retrieved April 13, 2004, from EBSCO Host Reseaarch database.

Jaworski, B. (1994). *Investigating mathematics teaching: A constructivist enquiry*. London: Falmer Press.

Jaworski, B. (1994a). Being mathematical within a mathematical community. In Selinger, M. (Ed.), *Teaching Mathematics*. London: Routledge.

Kapenda, H.M. (2007). Learner-centred approaches in math classes in Khomas region: Namibian cases. In I. Mutimucuio & M. Cherinda (Eds.), *Proceedings of the 15th annual meeting of the Southern African Association for Research in Mathematics, Science and Technology Education*, 09-12 January 2007, pp. 199-205. Mozambique: Eduardo Mondlane University Press.

Kelly, A. V. (1989). *The curriculum: Theory and practice* (3rd ed.). London: Paul Chapman.

Kelly, A. V. (2004). *The curriculum: Theory and practice* (5th ed.). London: SAGE Publications.

McCombs, B. L. & Whisler, J. S. (1997). *The learner-centred classroom and school: Strategies for increasing student motivation and achievement*. San Francisco: Jossey-Bass Publishers.

Murphy, E. (1997). *Constructivism*: *From philosophy to practice*. [Online]. Retrieved February 23, 2003, from http: www.stemnet.nf.ca/~elmurphy/cle.html

Namibia: Ministry of Basic Education and Culture (MBEC) (1999). *How learner centred are you?* Okahandja: NIED.

Namibia: Ministry of Education and Culture (MEC) (1993). *Towards education for all: A development brief for education, culture, and training*. Windhoek: Gamsberg Macmillan.

Namibia Human Resource Development Programme (NHRDP) (2002). *Improving Mathematics in Namibia*. Windhoek: Mathematics Inquiry.

Norman, D. A. & Spohrer, J. C. (1996). *Learner-centred education*. [Online]. Retrieved September 03, 2002, from http://infotrac.london. galegroup.com/itw/infomark/653/671/21505050w4/pul=rcl-EIM-0-

Ornstein, A. C. & Hunkins, F. P. (2004). *Curriculum: Foundations, principles and issues* (4th ed.). Boston: Allyn and Bacon.

Roesler, D. (2002.) *An exploration of cognitive learning and social constructivism*. [Online]. Retrieved May 30, 2002, from http://members.aol.com/-ht-a/mkahnl/Cours…1-7332/deborah-roesler.htm?mtbrand=AOL-US

Simmons, M. (1993). *The Effective of Teaching Mathematics*. London: Longman.

Tabachnick, B. R. (1998). Useful educational research in a transforming society. Journal of Education for Teaching, 24 (2), 101- 108.

Thompson, J., Licklider, B. & Jungst, S. (2003*). Learner-centred teaching: Postsecondary strategies that promote "thinking like a professional"*. [Online]. Retrieved October 05, 2003, from http://web3.infotrac. ga…/purl=rcl_EAIM_0_A102696729&dyn=8!ar_fmt?sw_ aep=uwcap

Van de Walle, J. A. (1998). *Elementary and middle school Mathematics*. New York: Longman.

Van Harmelen (1998). Is learner centred education child centred? *Reform Forum: Journal for Educational Reform in Namibia*, 8, 3- 10.

Voigts, F. G. G. (1998) Some policy suggestions for primary education based on a national survey of schools at grade six. In C. W. Jr. Snyder & F. G. G. Voigts (Eds.), *Inside reform: Policy and programming considerations in Namibia's basic education reform,* pp. 1 – 101. Windhoek: Gamsberg Macmillan.

Walczyk, J. J. & Ramsey, L. L. (2003). Use of learner-centred instruction in college of science and mathematics classrooms. *Journal of Research in Science Teaching*, 40, (6), 566 – 584.

Woelfel, K. D. (2004). *Learner-centred education: implementing the conceptual framework—moving from theory to action*. [Online]. Retrieved February 27, 2004, from http://web7.infotrac.galegroup.com/itw/infomark/904/694/43537308w7/purl=rcl_EAI…