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The Significance of Instructional Leadership for Effecting Curriculum Changes in Mathematics

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Abstract

School-based instructional leaders play an important role in creating an environment suitable for the continuous professional development of Mathematics teachers. This study investigates the role of instructional leadership for implementing curriculum changes in Mathematics in KwaZulu-Natal, South Africa. Heads of Mathematics Departments (HMDs) at selected primary schools in KwaZulu-Natal served as the main participants in the study. A structured questionnaire was used to collect qualitative data which supplied answers to the two pre-determined research questions of the study. Findings revealed that HMDs are faced with the challenge of overcrowded classrooms, a lack of knowledge about their instructional roles, and the limited capacity building programmes for mathematics teachers, among others. The study recommends a significant overhauling and restructuring in the teaching, learning and assessment of Mathematics as a subject at the intermediate phase. This study employed Valsiner's theory of socio-cultural learning to identify areas which Heads of Mathematics Departments should focus on in order to promote innovation and the effective implementation of the Curriculum and Assessment Policy Statement (CAPS) in the teaching and learning of Mathematics.

Keywords: curriculum; instructional leadership; Mathematics; CAPS.

Introduction

South Africa's transition to democracy in 1994 brought about major transformation to the country's education system (Hammet and Staeheli, 2013). Prior to 1994, the teaching of Mathematics to Black pupils was not taken seriously because the apartheid government found no reason to engage Blacks in employment that required these skills, but rather in menial jobs such as unskilled labour. Black teachers were not at liberty to adopt the best methodology which they felt could deliver teaching and learning of Mathematics effectively (Motshekga, 2016). To redress this slight on the intellectual capabilities of Blacks, curriculum designers took a special interest in investigating the discourse of teaching and learning of Mathematics within a multi-cultural and non-racial administration. A historical perspective established from literature indicates that during apartheid's educational administration, Mathematics and Sciences curricula were underpinned by an ideology of white supremacy. Mathematics and

natural sciences were considered higher disciplines and the preserve of Whites. As a result, Black teachers were poorly trained in Mathematics. After liberation, these same teachers were expected to implement curriculum change in Mathematics (Chisholm, 2000; Khuzwayo, 2003; Graven, 2004; Vithal and Skovsmose, 1999 and Volmink, 2009), when in fact they had been so deliberately neglected under White rule that they were seldom able to do so.

Instructional leadership and continuous professional development therefore became a priority after the South African government introduced Outcomes-Based Education in 1997 (Chisholm, *et al.*, 2002; Educational Labour Relations Act, 2003 and Volmink *et al.*, 2008). Although, several interventions have been introduced by government to address numerous challenges facing the teaching and learning of Mathematics in South Africa (Graven, 2004; Mudaly 2013; Spaull and Simkins, 2011; Vithal *et al*., 2005 and Bansilal *et al.,* 2017), the argument of this study is that those interventions may not achieve significant results unless there is a serious overhaul of instructional leadership positions at schools, especially regarding the subject of Mathematics.

This study was conducted within the framework of continuous professional development for Mathematics teachers. The lens of school-based support, guidance and coaching for teachers was used to determine whether Heads of Mathematics Department (HMDs) are able to improve the quality of teaching and learning of Mathematics knowledge and skills in the early stages of schooling. The study set out to investigate whether HMDs are providing effective instructional leadership on matters of classroom practices, approaches to pedagogical strategies and creating environments conducive for the teaching and learning of Mathematics. HMDs in the intermediate phase classes should be able to spearhead the professional knowledge required for the implementation of new and more effective teaching strategies. According to the Department of Education (DoE, 1998), HMDs are school-based curriculum specialists and instructional leaders who are charged with empowering Mathematics teachers with the knowledge and application of techniques to facilitate the teaching and learning of Mathematics. HMDs ensure that teachers of Mathematics' instructional practices are compliant with the goals of the national curriculum (Educators Employment's Act, 1998; Department Basic Education, 2011b; Department of Higher Education, 2015; Mokhele and Jita, 2010).

Studies have confirmed inadequate cognitive skills and conceptual knowledge among many Mathematics teachers in South Africa (Kilpatrick *et al.*, 2001; Kristin *et al.*, 2011; Ball *et al*., 2001 and Schoenfeld, 2002). Graven (2004) and Spaull (2011) note that the curriculum changes introduced in the Outcomes-Based Education initiative were beyond the abilities of many Black teachers who had suffered the effects of apartheid neglect and yet were expected to implement OBE in classroom practice in South Africa. There have been endeavours to review the general curriculum in the country which led to the Curriculum 2005 (C2005), National Curriculum Statement (NCS) and recently the Curriculum and Assessment Policy Statement (CAPS) which is the espoused curriculum. These curriculum changes appear to have yielded little improvement in the effective teaching and learning of Mathematics.

Killen (2012:45) indicates that quality in teaching and learning is defined as mastery of the subject's content knowledge, teaching strategies and cognitive development of learners. This definition exposes a significant gap in the quality of teaching and learning of Mathematics, especially in the so-called historically Black schools in South Africa.

In this study the emphasis was first on learning outcomes, contextualisation of teaching and acquisition of mathematical concepts, and skills and competences. Secondly, curriculum innovations introduced a new system of assessment which requires teachers to apply various strategies of assessment including baseline, formative, summative and diagnostic assessment. The curriculum changes in Mathematics required HMDs to ensure that the assessment of learning was continuous and holistic. Assessment is intended to be an integral component of teaching and learning: the concept of continuous assessment in Mathematics teaching and learning has required HMDs to develop a new mind-set: away from traditional content-based assessment to outcomes-based assessment. Teachers had to focus their teaching of mathematical knowledge on predetermined learning outcomes. The planning and organisation of knowledge to attain pre-determined learning outcomes had to be inclusive and learner-centred (Juta & Van Wyk, 2020). The principles of inclusivity and learner-centeredness are the key organisers and guidelines for identifying and prioritising learning outcomes, assessment criteria, content and teaching and learning strategies.

Literature Review

The literature review highlighted the different points of view regarding the concept of instructional leadership. To some researchers, the conceptualisation encompasses monitoring and supervision of activities related to the management and administration of schools (Goldring and Greenfield, 2002; Hallinger, 2003). This view acknowledges that those who are in management positions: Principals and their deputies should play a role in ensuring that schools provide an environment that is conducive to teaching and learning. This perspective promotes the view that Principals are the instructional leaders in schools. It was however opined from the works of David (2019), Fullan (2006) Barber and Mourshed (2007), and Carl (2010) that instructional leadership is mainly about supervision, support and the monitoring of teaching and learning. This view promotes the idea of assigning the senior teachers with the responsibility of mentoring, coaching, and performance tracking of newly appointed teachers. The senior teachers are expected to coordinate the curriculum, supervise, and evaluate teaching and learning instructions, monitor learners' progress, protect instructional time, provide incentives to teachers and learners, and promote professional development (David, 2019). Moreover, the Heads of Department are expected to build the pedagogical capacity, expand opportunities for curriculum innovation, and provide support for teachers (Educational Labour Relational Council, 2003). Fullan (2006) in the same vein, notes that the leadership capabilities of the instructional leaders are weighed against their expertise in creating healthy working conditions for teachers and learners through the promotion of collegiality, collaborative culture, and teamwork.

The synthesis of the conceptual model of instructional leadership was used as the platform to locate the findings on the significance of the roles the HMDs are playing in schools to revolutionise the teaching of Mathematics, and in adopting necessary strategies to advance the teaching and learning of Mathematics in schools (Tezer and Karasel, 2010).

Theoretical Framework

The theoretical lens adopted for this research is based upon the work of socio-cultural theorists such as Valsiner (1997), Goos (2009), and Iffah *et al.* (2017). Valsiner's Zones Theory enabled the researcher to focus on interrelated zones involved in the area of research. Valsiner's theory originated from the socio-cultural work pioneered by Lev Vygotsky which declares that the development of cognition is made possible through social interactions. The zone of proximal development (ZPD) in this theory is viewed as a continuum in human cognitive development: Goos (2009) believes that this theory enables a researcher to understand differences and interdependences in interactive learning in the school environment between teachers and their instructional leaders. Blanton (2005) also extended Valisner's zones theory when he employed it to examine interactions in implementing new knowledge and skills to in-service Mathematics teachers. Blanton advocated that the zone of promotion action could point to three different categories of performance in professional practice: rejection, acceptance or being ignored. The rejection of promotion action (zone of promotion action) are actions that are associated with resistance to the adoption of innovative practice or desired change, whereas acceptance of promotions (zone of promotion action) points to the adaptation and implementation of innovations or change, and the zone of pseudo-promotion action points to actions that indicate pretence or fake practices with no commitment to innovations.

The zone theory assisted the researcher in identifying variables in this study such as new strategies for improving the teaching and learning of mathematics which are classified as; the zone of promotion action (ZPA); interactions (for instance, approaches to collegial and collaborative efforts to implement new strategies of teaching and learning of mathematics) referred to as the zone of free movement (ZFM); and goals of the teachers and Heads of Department for improving pedagogical and subject content knowledge which were categorised as the zone of proximal development (ZPD).

Findings indicated that the zone of promotion action can be rejected, accepted, or ignored. A rejection of constructivist techniques and skills was identified by the HMDs' preference of the traditional methods of textbook teaching which was referred to as the zone of promotion action. The last category is the pseudo-zone of promotion action which indicates the HMDs' deliberate negligence, due to a lack of commitment, to adopt innovations.

The empirical research for this study draws upon the work of socio-cultural theorists to explore the role of HMDs in facilitating changes to the Mathematics curriculum as stipulated by the Curriculum and Assessment Policy Statement (CAPS). HMDs are expected to play a leadership role in implementing changes, and in dispelling false prejudices, such as that which assumes that Mathematics is the preserve of a few abstract thinkers (Adler, 2002; Volmink, 2009 and Vithal and Skovsmose, 1997).

The Educational Labour Relations Act (2003) asserts that HMDs ought to:

i. Control the work of educators and learners in the department concerning the development of assessment activities and keeping learners' progress records or mark schedules,
ii. Provide guidance and coordinate on the latest ideas and approaches to the subject, methods of teaching and learning, and techniques suitable for the effective teaching and learning of the subject content knowledge and skills.
iii. Effectively convey new strategies to the staff members concerned.

iv. Co-operate with colleagues to maintain good teaching standards and to collaborate with educators of other schools in developing and conducting extra-curricular activities.
v. Take on a leadership role in respect of the subject, and the learning phase, and to consider orientation, regional courses, new approaches, techniques, and evaluation in their fields.

Study Purpose and Research Questions

The purpose of this study is to examine the significance of instructional leadership in the implementation of curriculum change in Mathematics. The following research questions are proposed in order to achieve the purpose of the study:

i. To what extent do instructional leaders assist teachers to accept changes expected in the Mathematics Curriculum and Assessment Policy Statement (CAPS) for the intermediate phase?

ii. How do Mathematics teachers respond to pedagogical approaches promoted by the instructional leaders for the teaching and learning of Mathematics in an intermediate phase class?

Scope/Context of the Study

This study was conducted in KwaZulu-Natal, one of the nine provinces in South Africa. KwaZulu-Natal has seven educational districts and twenty-three circuit offices. Teachers teaching Mathematics in KwaZulu-Natal have been reported to be struggling to master the curriculum content of the subject they are teaching (Jansen, 2014). The researchers were motivated by the need to improve the state of Mathematics teaching and learning engagement in the province, and the country in general.

This study selected six circuit offices under two districts: iLembe and Empangeni districts. Empangeni is the largest district in the northern KwaZulu-Natal Province and has four circuits, some of which lie in remote rural areas such as Nkandla and Eshowe: two are in the vicinity of townships; Mthunzini circuit and Lower Mfolozi circuit. ILembe district schools under the administration of Maphumulo and Lower Tugela Circuits were also involved in this research study. Schools under the Maphumulo circuit, Nkandla and Eshowe were regarded as rural whereas schools selected from Lower Tugela, Mthunzini and Lower Mfolozi were considered as township or semi-urban schools.

Method

This study adopted a descriptive research design. According to Cohen *et al*. (2015) descriptive research encompasses the collection of a wide range of opinions or views about a certain phenomenon. Researchers in educational research, Cohen *et al.* (2005), Henning *et al.* (2004) and McMillan and Schumacher (2010) emphasise the importance of explanatory research into patterns that emerge from data. These researchers point out that questions require explanations

which can be provided only through qualitative methods. The study targeted HMDs who specialised in the supervision of Mathematics teachers, particularly those who are teaching at the intermediate level. The intermediate phase is perceived to be critical in the teaching and learning of Mathematics because it is transitional between foundation phase and senior phase. Research indicates that some schools prefer to teach Mathematical concepts in the learners' mother-tongue in the foundation phase, whereas in the intermediate phase learners are introduced to English as a medium of instruction.

Sampling, instrument and procedure for data collection and analysis

The sample of thirty-eight participants was purposively selected for the study: participants were selected based on their positions as Heads of Mathematics Departments in their various schools. An interview guide containing open-ended questions was used as the data collection instrument. Content analysis method was employed in analysing the responses of the participants to the interview questions. The interview guide was developed by the researchers to solicit qualitative data that represented participants' (HMDs) perceptions, reflections, and experiences. The instrument was validated using face and content validity, while a pilot study was conducted to determine the reliability. The questions were based on the duties and responsibilities of the Heads of Departments stipulated in the ELRC (2003) document. These were subsequently applied as benchmarks for making a judgement on the effect of instructional leadership role of the HMDs.

Ethical Considerations

Ethical issues are fundamental to the validity of any research study (Olaniran, 2017). Ethical issues such as access to schools and participants, as well as permission to conduct research were carefully considered in this study. The following measures were taken; first, the application for permission was sent to, and granted by, the Head of Education in the KwaZulu-Natal Department of Education. Permission to collect data was granted by School Principals and arrangements were made for appointments to discuss the purpose of the research. Letters of informed consent were distributed to all participating HMDs in the selected schools. These letters of consent assured participants that certain principles would be adhered to such as the principles of anonymity and confidentiality, freedom to answer questions without fear, and the knowledge that they would not be coerced to answer any question.

Results

Sample's demographic description

All participants were Heads of Department of Mathematics in their various schools. They were requested to provide information about their gender, and highest qualifications. They were also asked to state the years of experience they had in instructional leadership in their present places of work. The demographic data revealed that most of the Heads of Mathematics Departments involved were female (57.9%), had Bachelor of Education (B.Ed.) degrees (34.2%), and had over five years of working experience (55.2%). Meanwhile, other participants possessed, Bachelor of Education Honours degrees (B.Ed. Hons), National

Professional Diploma in Education (NPDE), and Senior Secondary Teachers Diplomas (SSTD). The gender variable in the demographic was set to determine the instructional leadership roles for female and male teachers. Information provided by participants about gender enabled the researcher to distinguish between perceptions and views along gender divides. There is a false belief that males are more mathematically intelligent than their female counterparts (Dickerson *et al*., 2015:22; Fryer and Levitt, 2010). The issue of attitudes and compliance with instructions from leadership was determined by contrasting the responses of male and female teachers.

Table 1: Demographic Data of the Participants

Variables	***Frequency***	***Percentage %***	***Total***
	Gender		*n=38*
Male	*16*	*42.1*	
Female	*22*	*57.9*	
	Qualifications		*n=38*
NPDE	*05*	*13.1*	
SSTD	*04*	*10.5*	
B.Ed	*13*	*34.2*	
B.Ed Hons	*07*	*18.4*	
Others	*09*	*23.6*	
	Years of Experience		*n=38*
1 year	*01*	*5.2*	
2 years	*05*	*13.1*	
3 years	*04*	*10.5*	
4 years	*07*	*18.4*	
5 years and more	*21*	*55.2*	
Total (n)	***38***	***100%***	***38***

Source: Field data

Qualitative Data Analysis

Table 2 is the summary of the qualitative data classified under the categories identified during the process of data analysis. The responses and views are of the Heads of Mathematics Departments from the focus group elicited by means of open-ended questions on the questionnaire.

Table 2: HMDs' responses classified according to the Zone of Proximal Development, Zone of Free Movement, and Zone of Promotion Action

Categories	Responses and Views of the HMD
Zone of Promotion Action (ZPA)	HMD1: *The aim is the same as learning outcomes. If teacher(s) understand the importance of learning outcomes that means they know the aim. My duty is to make sure that learners are taught and assessed. The teachers are experienced, they have been attending workshops on CAPS. Also, the textbooks and learner books are very clear about what teacher(s) should teach and learner(s) should know and do in each term.* HMD 2: *The aim of the Mathematics lesson comes from the teacher who teaches the subject. Do you think (the) HOD should tell us what the aim of each lesson should be? As long as we have books and (a) teachers' guide supplied by the school, to me (it) is enough.* *HMD2: One of the challenges we are facing here is the issue of overcrowded classes. Mathematics is a sensitive subject that must be taught where there is absolute quietness, but how will (a) teacher achieve the objectives when the class is crowded?*
Zone of Free Movement (ZFM)	HMD3: *I think it is important to know the general aim of the syllabus, because they are generic, but it is not something that we and teacher(s) worry about.* HMD4: *Selecting the teaching strategies differ(s) from teacher to teacher. In fact, teachers are exposed to all teaching strategies during their training. Also, as a qualified Science and Technology Teacher myself, I can choose methods that can enhance (the) teaching and learning of Mathematics such as collaborating with colleagues to learn from each other.* *HMD5: When teachers prepare their daily lessons, they are aware that the aim of teaching is to construct knowledge with learners. The department material helps us to understand what should be taught in each term. That helps us a lot. Sometimes teachers do not even bother about the aim written on the documents, I do not know whether to them it is important or not. Some of them simply teach from the textbook.*
Zone of Proximal Development (ZPD)	HMD 6: *I work harmoniously with my staff. We have a culture of sharing information in the meeting(s) about challenges and difficulties we have in classes.* HMD 7: *Yes, I would say but not generally. Meaning that some who attend workshops and upgrading courses*

	organised by the Department of Education are the ones who apply new teaching methods and share knowledge with the members of the department as a way of collaborating with each other. HMD 8*: One teacher expects me to call the parents of a poor-performing learner and advise them about alternative institution where the child can be taken to. I quickly reminded him about the inclusivity policy in education.*

The analysis of data was in conformity with the Valsiner's zones theory and it was used to classify data into three zones. The figure below indicates the broad themes established from the responses of the HMDs in the sample to the open-ended questions which elicited information in three critical areas: organisation of activities, creation of an environment conducive to effective teaching, and learning and ensuring the improvement of performance of learners in mathematics through innovative teaching techniques

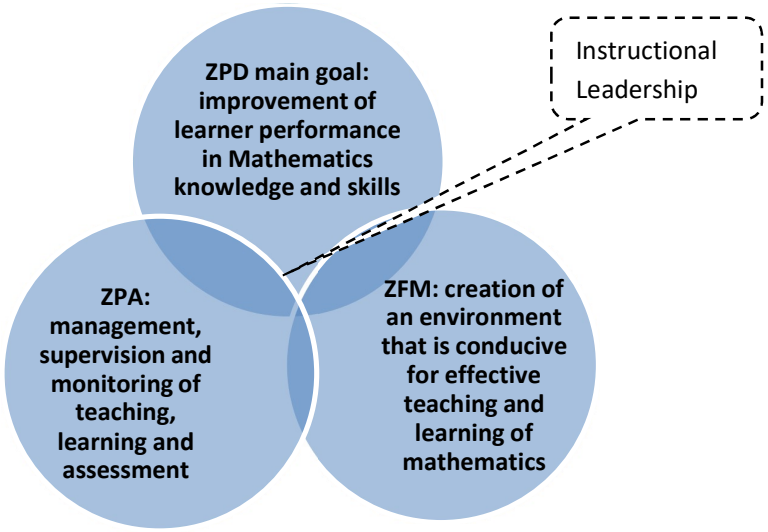

Figure1: The diagram shows the three broad themes classified according to Valsiners' Zones Theory

Findings

Issue 1: Inadequate performance of monitoring and supervision: the ZPA

Gaps in the HMDs knowledge and understanding of the supervision and monitoring role which falls under the zone of promotion action were elucidated from responses to the three main questions:

Question1: **What key activities do you prioritise for yourself and the staff in your department? The examples of such responses are:**

HMD2: My duty is to make sure that learners are taught and assessed. The teachers are experienced; they have been attending workshops on CAPS. Also, the textbooks and learner(s') books are very clear about what teacher(s) should teach and learner(s) should know and do in each term.

HMD 9: *Many of them are struggling to cope with the new methods and approaches brought by the curriculum innovation (CAPS). I think the teachers need to be well capacitated in these new approaches, though we have some non-governmental organisations such CASME that are encouraging Mathematics teacher(s) to take part in training workshops.*

HMD5: Sometimes teachers do not even bother about the aim written on the documents, I do not know whether to them it is important or not. Some of them simply teach from the textbook.

The views expressed above indicate a lack of commitment and responsibility by professionals who are entrusted with monitoring and supervision roles. These HMDs did not consider capacitating teacher with innovative approaches, conducting school-based workshops (on-site teacher training) to be the key monitoring and supervision responsibilities they had to execute. This attitude of HMDs has a negative implication for the performance of learners in the Mathematics subject knowledge and cognitive, psychomotor, and affective skills as well in their early education. In light of the assertion of the Educational Labour Relations Act (ELRA, 2001:c6) this attitude demonstrated by HMDs displays a failure to provide guidance, and coordinate activities to empower Mathematics teachers with the principles underpinning the approaches to organisation of the subject content knowledge, methods of teaching and learning and techniques suitable for the development of Mathematics conceptual knowledge and skills in the early stages of mathematics education.

According to the norms and standards for educators in the Education Labour Relations Act (2001:c6), Heads of Departments in schools are expected to: "provide guidance and coordinate on the latest ideas on approaches to the subject, methods of teaching and learning, techniques suitable for effective teaching and learning of the subject content knowledge and skills". The knowledge of the instructional leadership demonstrated in the response of HMD2 portrays the traditional perspective which describes leadership roles in terms of overseeing and controlling subordinates. The response also indicates that HMD2 had little interest in the manner in which learning content is structured and the strategies used by teachers to teach the subject content knowledge to the learners. The interpretation of this finding is that even the assessment of learners' performance in the subject was not monitored and supervised by the MHD. The failure of the HMD to carry out these critical duties implies that the performed action is negative (Zone of Promotion Action). This incompetent performance is considered in this work to be an issue that requires serious attention because HMDs are supposed to be the school-based curriculum specialists whose role is to empower and capacitate teachers with expert knowledge in classroom management, teaching and learning of Mathematics and developing learning content knowledge. The attitude demonstrated by MHDs about textbooks and learners' books revealed a lack of determination towards providing leadership in terms of what teachers should do to organise their learning material into meaningful teaching. The HMD did not demonstrate concern regarding differentiated learning styles in the Mathematics classroom. The textbooks and learners' books are not structured to respect the different

learning styles of learners, yet a teacher with the support of the HMD can re-organise learning activities to benefit all learners in the Mathematics classroom.

According to Valsiner's zones theory, the zone of promotion action (ZPA) is about the key performance areas which define the expertise and qualities of instructional leadership. According to the Educational Labour Relations Act (2003:c6) the six key performance areas for the HMDs comprise: (i) Control the work of educators and learners, (ii) Provide guidance and coordinate, (iii) Effectively convey new strategies to the staff, (iv) Co-operate with colleagues in order to maintain a good teaching standards, (v) collaborate with educators of other schools, (vi) Take on a leadership role in respect of the subject, learning phase.

The patterns of thought displayed by the raw data about the performance of the six performance areas were classified under (+ZPA) indicating positive performance; (-ZPA) the areas of weak performance; and (pseudo-ZPA) as the areas with negligence. The figure below indicates areas and performance of the participants (HMD)s:

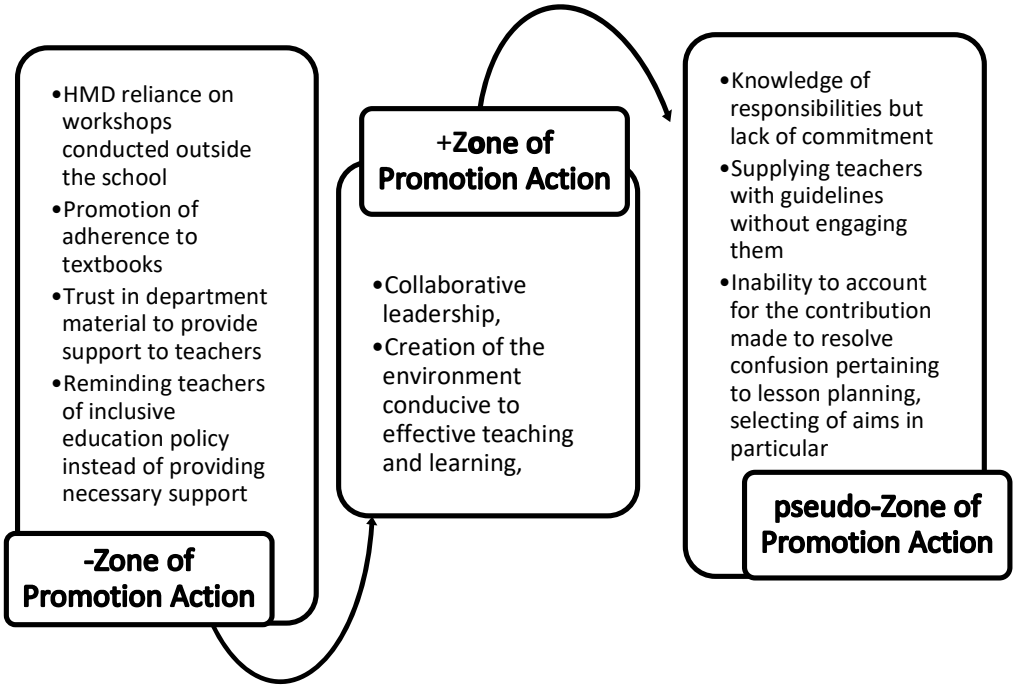

Figure 2: diagram showing aspects of (-ZPA), (-ZPA and (pseudo-ZPA)

Issue 2: Views indicating that HMDs promoted collaboration and creativity among teachers of Mathematics (*zone of free movement*)

The views indicating the awareness of constructivist principles in the teaching and learning of Mathematics from the participants were interpreted as the zone of free movement (ZFM). Based on the available data obtained from the field, HMDs find it beneficial to encourage collaboration among Mathematics teachers, which gives them the freedom to apply their creativity and innovative strategies to advance learners' performance in Mathematical conceptual knowledge and application.

Question2: **What approaches do you use to promote teamwork and collaboration among your staff members, which in your view enhance sharing knowledge of the proposed changes in the Mathematics CAPS**?

Typical responses were:

HMD7: *Educators are the ones who apply new teaching methods and share knowledge with the members of the department as a way of collaborating with each other.*

HMD4: *Selecting the teaching strategies differ(s) from teacher to teacher. In fact, teachers are exposed to all teaching strategies during their training. Also, as a qualified Science and Technology teacher myself, I can choose methods that can enhance teaching and learning of Mathematics such as collaborating with colleagues to learn from each other.*

HMD 6: *I work harmoniously with my staff. We have a culture of sharing information in the meeting(s) about challenges and difficulties we have in classes.*

The perception of the importance of learning varied from one to another implying the principle of social learning theory. These two HMDs confirm the view that interaction and sharing are effective ways of learning. The tendency demonstrated in this perception showed the value of participatory leadership as a strategy to allow teachers to develop a sense of freedom to work constructively without restrictions (Zone of Free Movement) in their endeavour to find solutions to challenges threatening effective teaching and learning of Mathematics in classes. Recognition of teachers as qualified professionals and acknowledgement of teachers' pedagogical content knowledge highlighted in the raw data are perceived as a strength of the (ZFM) and social theory of learning. This finding led to the conclusion that Mathematics teachers under this kind of leadership explore and test innovative strategies and techniques proposed in the Mathematic curriculum (Curriculum and Assessment Policy statement) to improve teaching and learning of conceptual knowledge skills.

Issue 3:The HMDs' views on the responses of Mathematics teachers to innovations and pedagogical approaches to the teaching and learning of Mathematics

The chief advantage of curriculum changes and all the innovations is to be found in the enhanced performance of teachers and learners. It is important to have instructional leaders such as Principals and Heads of Department (HODs) in schools, but it is pivotal to have teachers who are responsive to the changes or innovations being introduced to enhance teaching and learning.

Issue 4: The incompetent performance of instructional leadership role to improve the mastery of skills and conceptual knowledge of Mathematics

The data presented in figure 1 points out that the zone of proximal development (ZPD) in this study is the ability of HMDs' processes and activities of instructional leadership to turn around the declining performance of learners in mathematics. This finding is based on certain views, extracted from responses to the question:

Question 3: How do you support teachers with the challenges of underperformance of learners in Mathematical conceptual and cognitive skills (e.g. counting, operations, whole numbers, and fractions etc.)?

HMD 8*: One teacher expects me to call the parents of a poor-performing learner and advise them about alternative institution(s) where the child can be taken to. I quickly reminded him about the inclusivity policy in education.*

HMD3: *I think it is important to know the general aim of the syllabus, because they are generic, but it is not something that we and teacher(s) worry about.*

The views expressed in the data point out firstly that HMDs do not comprehend the ultimate aim of teaching Mathematics in the intermediate phase curriculum. According to Carl (2010) and Fullan (2006) instructional leaders, together with teachers are curriculum developers. This statement implies that HMDs, as school-based curriculum specialists, should ensure that the preparation of the learning content, learning objectives, teaching and learning techniques and assessment procedures serve the ultimate or general aims of the subject as asserted in the curriculum policy. The zone of proximal development in the instructional leadership is the level of determination demonstrated by HMDs in the planning and development of teaching and learning content, assessment and support provided to learners in accordance with the aims stated in the curriculum innovation of DBE (2010:8-9). HMDs' views should indicate the intervention or remedial strategies in place to ensure that teachers provide support to learners who experience learning difficulties in Mathematics. According to the curriculum policy the aims are to: (i) ensure that learners develop a critical awareness of how mathematical relationships are used in a social environment; (ii) learners should develop confidence and competence to deal with mathematical situations without being hindered by fear or curiosity, and (iii) learners should develop a deep conceptual understanding and acquire skills necessary for the application of Mathematics to physical, social and mathematical problems.

Discussion

The interpretation, discussions and synthesis of findings helped to define the perception of the HMDs in their instructional role; to ensure that teachers are adequately equipped to understand, implement and structure into lesson plans, the progressive ideas that underpin the espoused Mathematics curriculum for intermediate phase classes under CAPS. A defining criterion for determining the effectiveness of HMDs was their competence to engage teachers in the design and development of school-based learning programmes that focus upon essential mathematical skills. HMDs are tasked to implement teaching strategies that enable learners to apply mathematical knowledge in various real-life contexts. HMDs are expected to supervise and provide support to teachers, while facilitating teaching and learning activities.. HMDs themselves are expected to possess adequate levels of conceptual knowledge, which includes developing number concepts and mathematical vocabulary, as well as adequate level skills and competences in the application of mathematical knowledge. This entails cognitive skills: communication, thinking, logic, reasoning investigating, analysing, representing posing and problem-solving and interpretation of information (ELRC, 2003: DOE, 2000).

The role of the HMDs in the teaching, learning and assessment in the Mathematics Department is to provide guidance and support to teachers with the proper understanding of the importance of the aim of the Mathematics curriculum in the intermediate phase of teaching and learning. According to Carl (2010) and Fullan (2006) school-based curriculum developers have to demonstrate competence in interpreting the aims and principles underlying the espoused curriculum and be able to encapsulate these two essential pillars of curriculum in

their learning programmes. According to scholars in curriculum research, the aim of the curriculum is inherent in the philosophical paradigm which dictates the learning outcomes, pedagogical approaches, and assessment procedures (Ornstein and Hunkins, 2014; Carl, 2010; Kelly, 2010).

The study found that HMDs are able to encourage collegiality among their Mathematics teachers, which fosters partnerships and collaborations. Fullan (2006) emphasises the importance of partnership and collegiality in the context of curriculum transformation. HMDs are expected to work collaboratively with teachers under their leadership to develop policies and programmes, and implement curriculum innovations. Carl (2010) indicates that the style of instructional leadership for effective collaborative engagement should avoid antagonism and resistance: consultative approaches and communication should be underpinned by democratic values such as acknowledgement, recognition and respect for one another. Zuber-Skerrit (2011) states that an instructional leadership style that embraces democratic values should ensure; equal opportunities, self-belonging and self-realisation in all collaborative and collegial engagements that sought to empower individuals in an organisation.

The findings of the study indicated that most participants considered the aim to be of great importance in the planning and development of teaching and learning activities. Some HMDs were able to provide necessary support for their teachers in understanding the aim, some of them felt the teachers had been trained and should know the aim and be able to apply it to their classroom teaching by default. This finding points to inadequate conceptualisation of the two concepts: ‘learning outcome’ and ‘specific curriculum aim’ by HMDs. Lack of essential knowledge among HMDs about performing their instructional leadership role effectively implies that teachers who rely on these instructional leaders for guidance and support in the teaching and learning of Mathematics have limited conceptual and procedural knowledge of the professional practice required to implement these innovations. The Educational Labour Relations Council (2003) emphasises the importance of the role of HMDs in school-based curriculum development as it states: the Heads of Department should work collaboratively with teachers to design teaching and learning policies in the phase and to guide teachers in preparing and organising the learning programmes for the subject.

Section 2 of CAPS DBE (2011:8) elaborates upon what the specific aims for grade four, five and six entail. The following are the key issues for those implementing the curriculum:

- To develop a critical awareness of how mathematical relations are used in social, environment, cultural and economic relations.
- To develop confidence and competence to deal with any mathematical situation without being hindered by fear of Mathematics.
- To develop a spirit of curiosity and a love for Mathematics.

The specific aims of teaching and learning of the Mathematics curriculum from the DBE (2011) perspective provided HODs with the premise or point of departure for their schools-based curriculum development. According to Carl (2010:41) school-based curriculum development is the implementation phase which entails a high teacher participation and the proper orientation of teachers into issues of: planning content, learning and teaching support material and selection of relevant pedagogical strategies.

Fullan (2006) emphasises that instructional leaders should, in consultation with teachers, identify teaching and learning support materials and teaching strategies for delivering the curriculum efficiently and effectively in their classroom practice. Limited knowledge and inadequate interpretation of the curriculum policy guidelines were found to be threats facing the implementation of changes in the Mathematics curriculum; supporting the concerns highlighted by Seobi and Wood (2016) that HODs as instructional leaders struggle to interpret the transcripts of what they should do. According to the DBE (2011) Mathematics teachers under the instructional leadership of the HMDs should align the learning activities with an adequate context, concepts, cognitive skills, and applied abilities within the framework of the intermediate phase Mathematics curriculum's specific aims. Teaching and learning should serve the aim of the curriculum. HMDs in their position of instructional leadership are called upon to supervise designing daily, weekly and quarterly teaching, learning and assessment activities. This alignment should be approved and supervised by the HODs as overseers of curriculum implementation in the classroom.

The findings revealed an inadequate capacity building programme for Mathematics teachers. HMDs confessed that only teachers who have had the opportunity of attending training organised by NGOs were able to apply the techniques and innovations of CAPS in their classrooms. This, perhaps, is a great contributing factor to another finding of the study which revealed Mathematics teachers' inability to assist poor performing learners in Mathematics. Woods (2016) and Barasa (2020) emphasised the importance of training for capacity building of teachers. In the absence of adequate capacity building programmes for teachers, Heads of Department have a limited capacity 'to foster the trusting relationship necessary for the effective mentoring, coaching and teamwork essential for the provision of quality instructional support'. For the teaching and learning of Mathematics in the intermediate phase, this finding implies that teaching and learning in Mathematics classes continues to be problematic because learners' performance in mathematical conceptual, application skills and numerical literacy continues to decline. These worrying findings about the weaknesses among HMDs were confirmed by this research project.

Conclusion

This study finds that the role of instructional leaders such as HMDs is significant in implementing curriculum changes regarding the teaching and learning of Mathematics. A defining criterion for determining the effectiveness of HMDs was their competence to engage teachers in the design and development of school-based learning programmes that focus upon essential mathematical skills. HMDs are tasked to implement teaching strategies that enable learners to apply mathematical knowledge in various real-life contexts. HMDs are expected to supervise and provide support for teachers' teaching and learning activities, support learning material, and ensure the development of skills and competences in the application of mathematical knowledge.

The findings of the study conform to Valsiner's zones theory which was the lens used for conducting this study; with a view to establishing the working relations between Mathematics teachers and their supervisors and mentors; in the context of curriculum transformation in schools. The three pillars advanced by these theories are collaborative engagement, collegiality, and cooperation: these were seen as essential tools in the hands of the participants

of this study in working with the Mathematics teachers. These three pillars are the determinants of an environment conducive to knowledge sharing and socio-cultural learning. The promotion of collegiality among staff members by the HMDs shows the good practice of instructional leadership. Effective curriculum implementation requires teachers and instructional leaders to share a common vision of what ought to be achieved in improving teaching and learning; to ensure that learners achieve the maximum performance in the subject.

This study identifies an inadequate knowledge among the HMDs about their instructional roles, an inadequate capacity building programme for teachers, and overcrowded classrooms, among other challenges hindering the effective implementation of curriculum changes in Mathematics at the intermediate phase level.

Recommendations

Based on these findings, the following recommendations are made:

i. Establishment of a clear-cut structure of instructional leadership: This study recommends that the developers of the Mathematics curriculum at national level should form a cascading structure for dissemination and adaptation which can operate interdependently with their school administration and management organogram. The school-based instructional leaders, as part of the professional development structure at curriculum delivery level, should be accountable not to the principal but to the curriculum cascading structure. In this sense accountability should include all key performance areas of the HMDs, as well as the creation of links between Mathematics teachers and development centres; and Mathematics teachers and subject professional bodies.

ii. Action-driven mentoring: This study suggests that levels of accountability on the adaptation process should be action research driven, which implies that Heads of Mathematics Departments, in collaboration with teachers, should indicate the challenges they encounter in implementing innovations proposed by initiating research into improving the quality of teaching and learning of Mathematics in early stages of schooling. This proposal is made in full awareness of the fact that the system of advisory services is currently in place. The Department of Basic Education (DBE) alleged that subject advisors at different levels are not keen on monitoring and providing assistance to Mathematics teachers. It is for this reason that this study emphasises the accountability of all professional structures involved in curriculum development, through cascading and adaptation, to report consistently on their operations. The question about the regress in the improvement of learners' performance in Mathematics should be answered by this hierarchical structure, from bottom to top, and top to bottom.

iii. Capacity building of instructional leaders: Adequate training and seminars are necessary for Heads of Mathematics Department (HMDs), relating to their instructional leadership roles and how best to focus upon collaborative partnerships with other stakeholders to improve curriculum delivery in classrooms.

iv. Training and re-training of Mathematics teachers: Adequate and up-to-date training and retraining for Mathematics teachers teaching at the intermediate level in schools is essential for the implementation of curriculum changes. This study is of the view that through consistent training, support and mentoring of teachers, the quality of teaching and learning of Mathematics could improve.

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