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MIDDLE MANAGEMENT AND INSTRUCTIONAL LEADERSHIP: THE CASE OF NATURAL SCIENCES' HEADS OF DEPARTMENTS IN SOUTH AFRICA

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Abstract. Natural sciences heads of departments often find themselves in the middle, shuttling between one role as part of the school management team, and another as an ordinary classroom teacher whose role as subject and instructional leaders is made even more complex because of the several duties incorporated in the subject which brings together other science disciplines, with each having its own disciplinary culture and expectations. The crucial role played by this group of teachers in the area of management and instructional leadership can go a long way in determining effective output in teaching and learning. This study reports on a mixed methods approach to explore the practices of natural sciences heads of department, as they provide instructional leadership to the teachers in a multidisciplinary context of their subject. This research involved 30 participants who responded to the questionnaire and 6 purposively selected subject heads of department interviewed and observed from four districts in the Gauteng Province of South Africa. The data collected through questionnaire, semi-structured interview and observations were analysed using descriptive statistics and content analysis. The results from this investigation revealed that natural science heads of departments devise creative ways to mitigate the challenge of differently qualified natural science teachers. These study concludes that the effectiveness of heads of departments as instructional leaders is influenced by the immense pressure from the dual roles of managing from the middle, which also appear to affect the optimal implementation of the natural science curriculum

Keywords**:** Head of department; Instructional leadership; Middle management; Natural sciences

I. INTRODUCTION

There is a growing scholarship in South Africa on the importance of instructional leadership in improving learning outcome in schools. Much of the research in this area focuses on the role of the school principal in instructional improvement (Bush, Glover, Bischoff, Moloi, Heystek & Joubert, 2006; Hoadley, Christie & Ward, 2009, Mestry, 2017). One of the gaps in the research has been on the role of the heads of departments (HODs) as a key member of the school management team (SMT) responsible for instructional improvement in the school. Due to lack of attention given to HODs in both research and policy, there is confusion about the exact placement of the HODs position on the organogram in schools (Barnett, Shoho & Olewszeski, 2012; Wanzare, 2013).

The position of HODs is a formal position with concurrent powers and responsibilities. As middle managers, HODs operate somewhere between the SMT and only a professional level higher than teachers, but because of their teaching duties (which make up 85% of their time in South Africa), they often find themselves at the same level as teachers (DoE, 1999). Teaching takes most of their time and they have limited time for providing leadership (Glickman, Gordon & Ross-Gordon, 2011). Historically, HODs mostly served as a communication link between teachers and the management, without any evaluative power (Ng, Nguyen, Wong & Choy, 2015). Their role has evolved over the years to include being both leaders and followers (Spillane, Halverson & Diamond, 2004). In a typical South African public school, a science HOD would lead a team of science teachers but could also be teaching English and would have to comply with the demands and expectations from the English HOD, thus assuming the role of the follower.

Science HODs have a more complex task of leading in a multidisciplinary context, where the offerings are less specialised. Natural Sciences (NS) is a multidisciplinary subject comprising four science disciplines viz., chemistry, earth sciences, life and physical sciences. It is a junior secondary subject that belongs to a group of science subjects

(Ng et al., 2015) constituting the science department in secondary schools. Spillane and Hopkins (2013) call this structural arrangement of departments in schools- 'a system and organisational infrastructure' (p2). This arrangement in secondary schools brings together a group of subjects like mathematics, mathematical literacy, agricultural, life, natural and physical sciences in South Africa. In this context NS lays the foundation for at least four high school subjects, viz., physical sciences (PS), life sciences (LS), geography and agricultural sciences. On the other hand, being a junior secondary school subject, NS tends to compete with subjects like mathematics and physical sciences for time and resources, which might have a higher status within the structural arrangement of science departments in schools. It is not likely that the NS teachers would be specialist in all the subjects listed above, nor would the science HODs who lead the subject departments. If no one is monitoring and providing guidance and support in NS instructional practices of these teachers, it will lead to poor learner performance in the subject (Spillane et al., 2003).

One of the key science HOD tasks is to monitor NS instruction. In order to do this, the sciences HODs are expected by policy and practitioners to have knowledge of the subject and expertise in teaching it. As instructional leaders, they are expected to have subject competence in the classroom and sufficient subject teaching experience (Angelle & DeHart, 2011; Ghamrawi, 2010). The subject expertise and skills in leadership displayed by the HOD as a specialist (Ghamrawi, 2010) builds the confidence that the teachers have in her/him and enhances her/his professional credibility. Teachers need to be convinced of the leadership capacity of those who lead. The HOD should also show self-esteem and have confidence in her/his own expertise (Wanzare, 2013).

The position therefore demands that the HODs have the ability to influence members of their own department through influential relationships and desired behaviours (Spillane, Hallett & Diamond, 2003; Mestry, 2017). All these competencies and attributes of the HOD are essential to effectively fulfil the role of an instructional leader in the school. Literature reviewed to date shows that little or no research has been undertaken to understand the crucial role that these middle managers play in the teaching and learning processes of the school, and to identify the areas where support and development can further enhance this role. This study and its findings aim to make a contribution to the scholarship and practice of instructional leadership in schools.

There is limited research on instructional leadership in South Africa. A number of studies focus on the effect of the quality of leadership of principals on teacher effectiveness and learner performance (Naicker, Chikoko & Mthiyane, 2013) and on management of schools, but few studies focus on curriculum and instructional leadership in schools (Bush, Joubert, Kiggundu, & Van-Rooyen, 2010). Where leadership in schools is addressed, the studies tend to focus on principals as leaders in the schools, including being instructional leaders. There is limited, if any, focus on middle management in schools (Barnett et al., 2012; Koh, Gurr, Drysdale & Ang, 2011; OECD, 2011) globally and in South Africa.

A comprehensive study by Hoadley et al. (2009) investigated the management of curriculum at different secondary schools. This study focused on high schools and the principal as the instructional leader, and it was not subject specific. However, research suggests that principals are not in a position to influence classroom teaching directly, because they spend less time with teachers than HODs (Highfield, 2010; Lai & Cheung, 2013) who in contrast, spend more time with teachers and are therefore in a better position to influence their instructional practices. This makes the role of the HOD as part of the instructional leadership team essential to influencing the teaching processes and learning outcomes.

Middle management is described differently in the literature. Several scholars describe middle management in schools such as lead teachers or teacher leaders (Stephenson, 2010), senior teachers, department chairs (Skinner, 2007), master teachers and HODs (Brown, Rutherford & Boyle, 2000; Turner, 2003). HODs are expected to be change agents for all the school reform initiatives on one hand, yet on another to foster effective teaching and learning in the classrooms (Angelle & DeHart, 2011). There is therefore a shift to label HODs as middle leadership, which involves managing people, resources and processes. Working with people would include influencing their behaviours and attitudes about instructional practice.

HOD Roles and Responsibilities as Middle Managers

Angelle and DeHart (2011), Spillane and Hopkins (2013) and Wanzare (2013) all agree that the legitimisation of the HOD role emanates from the acceptance by members of the subject department that the HOD is generally knowledgeable about the subject, possesses cross-grade level curricular knowledge and can develop teaching and learning materials like SBATS. Furthermore, HODs are expected to conduct classroom visits, demonstrate lessons, provide guidelines and provide teachers with helpful feedback to improve their teaching (Wanzare, 2013). They are also expected to set academic goals, standards for achievement, monitor achievement levels, evaluate practices and learning, maximise the effort of instructional organisation, appraisal and staff recruitment (Ng et al., 2015). However, the role of an HOD is complex, influenced by contextual factors and assumes different forms of leadership (Hallinger & Heck, 2011). It is compounded by conflicting expectations from principals, teachers and HODs themselves. Very little is known about how HODs go about doing their work and their perspectives on what the role should entail (Stephenson, 2010).

In South Africa the Department of Basic Education (DBE) has realised that school leadership needs to be adequately prepared and developed (Bush, 2013) by introducing a certificate programme in school management and leadership for school principals (DoE, 2002). Numerous programmes have been instituted to achieve this goal; however, the focus has still been mostly on management and administration of

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schools and not on instructional leadership (Bush, Joubert, Kiggundu & van Rooyen, 2010). Furthermore, the focus is mostly on principals and not the school middle management. Even though principals may be specialists in some subject areas their role is whole school curriculum management rather than subject specific management. Curriculum in secondary schools is specialised and specialists like HODs contribute better in the development of subject instruction and improvement of subject performance.

What seems to be missing is the development of school instructional leaders and even more important, the recognition of HODs as middle leaders that can be entrusted with the role of leading teaching and learning in the schools. In our experience as a teacher and a subject advisor, in the majority of South African junior and senior secondary schools, HODs are appointed into formal positions. Teacher leaders, other than HODs, in South Africa are not formal and they are sometimes chosen by teachers themselves as opposed to HODs or departments chairs (Guthrie & Schuermann, 2010; Skinner, 2007) where the candidate him/herself would contest for the position. In other countries like New Zealand and Hong Kong teacher leaders are nominated by teachers based on their expertise (Lai & Cheung, 2013; Stephenson, 2010). Literature also reports that teacher leaders are sometimes brought in by a project in the school or district and when the project closes or exits the positions also cease (Stephenson, 2010). Teacher leaders tend to focus on the classroom, the teacher and learning. Some teacher leaders do not teach because they focus on assisting different teachers in the implementation of curriculum in the classrooms and not on managerial and administrative duties like HODs.

Subject-specific Instructional Leadership

Middle management in schools comprises managers who are experts in their fields, usually a subject. Although a large amount of research has been done on curriculum implementation in South Africa (Kriek & Basson, 2008), little has been done on instructional leadership in NS and how it shapes the teachers' instructional practices. Instructional leadership research is an emerging area that is currently poorly understood. The enhancement of this limited instructional leadership research in South Africa calls for subject-specific instructional leadership research to accommodate all the nuances of the subject, its philosophies, cultures, principles and beliefs, held by teachers, learners and parents about the subject.

Instructional leadership is a set of leadership practices involving planning, evaluation, coordination and improvement of teaching and learning (Robinson, 2010). It involves sharing a vision with followers, monitoring the instruction and assessment standards, allocating resources and reflecting on the outcome of the instruction (Lai & Cheung, 2013). Skinner (2007) describes it as an ongoing process of providing professional support for other teachers and facilitating the movement towards a more collaborative and effective teaching of learners for the purpose of overall improvement of schooling. All these descriptions vary in their focus and as researchers, we find instructional leadership to be about having a vision that influences the quality of instructional practices and teaching choices that teachers make which lead to improved learning achievement by learners and teachers themselves. Although subject-specific leadership would concern itself with one particular subject, ensuring that the subject instruction is advanced and the performance of learners in the subject is improved, the aggregate effect if all subjects improved would result in the whole school improvement.

The Subject- Natural Sciences

Unlike their senior secondary school counterparts, the primary and junior secondary science HODs have a more complex task of having to lead in a multidisciplinary context of NS, which often includes physics, chemistry, life, earth, environmental and agricultural science disciplines for example. Though a foundational subject, NS is usually taught by teachers who are either generalists or specialists in only one or occasionally two of the five NS domains. Specialists are likely to occasionally leave out the sections they are not specialists in (Ng et al., 2015) while generalists seem not to adequately provide the depth of the different discipline. This shallow exposure to the subject results in learners who are poorly prepared to engage with the science content meaningfully.

The grouping of subject-disciplines under NS is likely to pose challenges to the HODs, who may be expected to provide leadership in areas some of which they have no expertise in, or where followers' (teachers) may have more expertise than the HODs. NS or integrated science is not unique to South Africa though, but is offered in other countries such as in USA (California and Colorado), BOLESWA (Botswana, Lesotho and Swaziland) countries, Nigeria and Malaysia. In Malaysia for example the prominent challenges of integrated science involved delivering and managing science instruction, and administering science instructional facilities and equipment.

Teachers of various educational backgrounds teaching science subjects were common in most schools. This resulted in teachers with various subject majors' background often required to teach science subjects which they were not trained for (Osman, Halim & Meerah, 2006). For South African schools the challenge is how the local department of education equips the schools to meet this demand for better qualified teachers and subject leaders.

Conceptual Framework

The role of subject leadership is context dependent and there is no one hymn sheet for leading the same department in different schools (Hallinger & Heck 2011). The actions of the HODs often depend on the leader him/herself, the task that needs to be performed, the departmental staff or followers and the situation (Timperley, 2005). To understand the work of the HODs fully, this paper proposes a conceptual framework that marries Turner and Bolam's provisional model (Turner & Bolam, 1998) with the teacher leadership framework proposed by York-Barr and Duke

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(2004). We introduce the component of reflection into the extent of the influence of the leadership on the teaching and the learning outcomes. The framework is based on the research into the effects of the roles and characteristics of HODs as instructional leaders. Six major components of instructional leadership by HODs have been identified in the literature and are discussed here under.

The first three components could be viewed as inputs into the subject leadership system. The first component focuses on the personal profile of the HOD like subject proficiency, experience in the subject (Smith, Mestry, & Bambie, 2013), professional credibility, trustworthiness, the agency of the HOD in resourcing the subject department. The second component is the role expectations which include vision setting, building relationships, collegiality, developing teachers and how leadership is distributed among members of the department (Koh et al., 2011). The third component is contextual (social, political, economic and cultural) factors and school conditions which the HOD negotiates his/her influence through (Robinson, 2010; Bendikson, Robinson & Hattie, 2012).

The fourth component is the process of influencing teaching choices through aligning instruction with assessment, planning instruction, developing reflective practice using interpersonal skills to establish trusting and collaborative relationships not only formally but also through informal collegial activities (Barnett & Aagaard, 2007). The fifth component of administration and management involves the overarching role of managing people and resources (see figure 1). This component contributes to how the other components interact to achieve the goals of the department and the school.

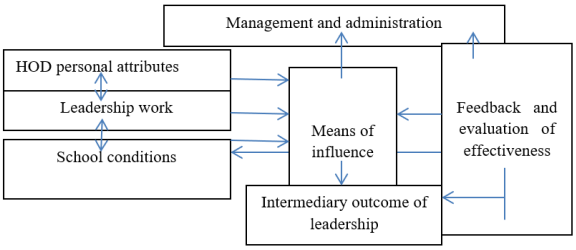

Fig. 1 Abridged version of the conceptual framework for leading instruction. (Adapted from Turner & Bolam, 1998; York-Barr & Duke, 2004)

The sixth and last component introduces the feedback and evaluation of the effectiveness aspect of leadership. It involves critical reflection by individuals, teams, and the organisation, mentorship and dialogues about effectiveness of instructional practices and learners' work (Lashway, 2002). The HOD consistently monitors the alignment of curriculum, instruction and assessment standards using data and technology to ensure accountability for performance in the classroom (Nguyen & Ng, 2014). This component provides the feedback to other components of the framework (Bendikson *et al.*, 2012).

The findings from the evaluation form the basis on which the other components are modified and enhanced to achieve the set goals. The main outcome of schooling and focus of the framework is to achieve effective teaching practices and improved learning outcomes within the department and school. This outcome is affected by all six components and has feedback effects to all the other components. Using the conceptual framework developed in Fig. 1, we then ask the key questions of our study: What are the experiences of science HODs as they lead natural sciences instruction? How can the capacity of science HODs be enhanced to provide effective instructional leadership?

II. Methods

This investigation adopted the mixed methods approach. The purpose of this mixed methods study was to explore, from HODs' perspectives, how they provided instructional leadership for NS using self-reported data from two sequential strands (Cresswell & Plano-Clark, 2011). We employed a quantitative questionnaire strand, which was followed by a qualitative strand comprising individual semi-structured interviews, meeting observations and documentary analysis in order to attain a better understanding of the research topic while ensuring that meta-inferences that would be made were valid and justified. The mixed method approach enabled probing for trends that emerged from responses to the questionnaires and these were validated using purposefully selected HODs' interviews, the analysis of artefacts and meeting observations. The qualitative and quantitative findings were integrated at the final stages to create meta-inferences that provided more insightful and complete answers to research questions.

Mixed Methods Sampling

Questionnaires were sent to 243 schools and in total 112 schools from four Gauteng Provincial Districts participated in the quantitative study. A subset of this sample (Teddlie & Yu, 2007) was selected for in-depth semi-structured interviews, participant observations of department/subject meetings and document analysis. The first phase collected data from science HODs and NS teachers from four districts using questionnaires. The second phase involved interviewing a purposive, stratified sample of science HODs and NS teachers, although this paper will only discuss the interviews with the HODs. Subject meetings observations were conducted and document analysis of meeting minutes, HODs and teacher files were also examined.

Data Collection

We used a mixed methods study of six schools from four districts in the Gauteng Province, to examine how HODs perceived their role as NS instructional leaders in their schools. We specifically examined what subjects HODs taught and whether they had release time to carry out their HOD duties; what practices they enacted in order to meet NS teachers' expectations of their role; what administrative and compliance activities they carried out; and the kinds of support that they received from the schools and the local district offices. In this study, we identified different means of influencing teaching and learning and explored ways in

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which HODs mitigate the challenges that they encountered to support instruction. This is because learners' achievement is affected by core leadership practices such as setting directions, developing staff, developing the organisation culture and managing the instructional program (Mestry, 2017).

The is clearly supported by Hallinger and Heck (2011) who confirms that leadership is enacted within the practical constraints of a local context.We recorded responses of all science HODs in the sampled schools and focused on the biographical data of NS teachers in order to understand the profile of the teachers that science HODs had to lead. Secondly, we focused on the role demands on HODs' time. These included instructional, administrative, management and leadership activities (Brown, Rutherford & Boyle, 2000; Koh, Gurr, Drysdale & Ang, 2011) that science HODs spent most of their time in and got allocated to do. We also explored the decisions they made as middle managers regarding managing some of the departmental routines (Spillane & Hopkins, 2013). We explored these activities to understand how their impact would be felt by the calibre of the NS teachers as displayed by the biographical data. The third focus is on the support and professional development that HODs themselves needed in order to be able to carry out their leadership duties effectively and whether principals and subject advisors provided any support.

Mixed Methods Analysis

Mixed methods data analysis involved analysis techniques from the quantitative and the qualitative approach, as well as a mixture of the two forms of data sequentially in this study. We received questionnaire responses from 30 HODs out of a total of 112 schools that participated in the study from four districts in the Gauteng Province. The HODs' instructional leadership activities were rated on the basis of how frequently they did them (1 indicated 'never' while 5 indicated 'always'). Some descriptive statistical analysis was done on the quantitative data and these results could not be generalized outside this study setting. The semi-structured interviews with six HODs were audio-taped and transcribed and field notes of the meeting discussions were taken. We conducted content analysis of interview data, field notes, department files and educator files, learners' activity books and discourse analysis of minutes of department meetings. Several patterns were identified in Phase 1 (quantitative strand) which became the basis for Phase 2 (qualitative strand) data collection. In Phase 2, interview transcripts were coded for HODs' perspectives on leading and managing NS instruction using an open coding strategy (Strauss & Corbin, 1990). We then analysed coded data and identified patterns and checked their prevalence across schools. In order to ensure anonymity and confidentiality of the participants, we adopted the use of codes for the six participants that were interviewed, such as (PT1, PT2… PT6).

III. Results And Discussion

The results from this study show some trends of practices that HODs engaged in to support NS teachers. The findings provide actual experiences of HODs and how they got around some of the challenges they meet in providing NS instructional leadership. We look first at the profiles of HODs in the study and the sizes of science departments.

Profile of HODs

We followed up six HODs from two districts. Table I shows the profile of the HODs followed up while Table II shows the demographic distribution of all the HODs who participated in this study.

TABLE I
PROFILE OF HODs THAT WE FOLLOWED UP

Name	School/school type	Age range	Gender	Institution of professional qualification	Specialisation	Subjects in the department
PT1	Alpha/ semirural	40-49	M	Teachers' College	Maths	NS, Maths, Math Lite.
PT2	Fhutura/township	30-39	M	University	NS	Tech, PS, LS, NS
PT3	Knowledge/ township	50-59	F	Teachers' College	LS	NS
PT4	Mooredale/urban	40-49	F	University	maths	Maths, PS, LS, NS & Math Lite.
PT5	Promise/ township	30-39	M	Teachers' College	PS	NS, LS and PS
PT6	Sheba/ township	40-49	M	University	PS	NS, PS,LS

Maths-mathematics; Math Lite-mathematical literacy, LS-life sciences, NS-natural sciences, PS –physical sciences, Tech-technology

These HODs were part of the bigger study of 30 HODs who had returned their questionnaires. There were more females in the study compared to males, with 17 (56.67%) of the participants being women compared to only 13 (43.33%) men. Most of the HODs were in the 40-49 and 50-59 age groups which accounted for 13 teachers (43.33%) respectively. Only four HODs (13.34%) were in the 30-39 age group.

Most of the HODs (11) had the Secondary Teachers Diploma (STD) as their highest educational qualification and they formed 36.67% of the whole study sample. Only 4 (13.33%) of the participants held a degree, whilst 5 (16.67%) held a post graduate diploma and the same frequency, 5 (16.67%), held Honours Degrees. The majority of the HODs, 10 HODs (33%) had majored either in life sciences or physical sciences. Only 7 HODs (23.34%) specialised in NS and the remaining 3 HODs (10%) had other specialisations.

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TABLE II
DEMOGRAPHIC DISTRIBUTION OF HODs

Variable	Level	Frequency	Total (n)
Overall		**N(%)**	**30**
Sex	Male	13 (43.33)	
	Female	17 (56.67)	30
Age	30-39	4(13.34)	
	40-49	13 (43.33)	30
	50-59	13 (43.33)	
Subject of Specialisation	Life or Biological Sciences	10 (33.33)	
	Physical Sciences	10 (33.33)	
	Natural Sciences	7 (23.34)	
	Other	3(10.0)	30
Type of Institution where qualification was obtained	Teachers' college	20 (66.67)	
	University	10 (33.33)	30
Highest Qualification	PTD/PTC	1(3.33)	
	STD	11(36.67)	
	ACE	3 (10.0)	
	Bachelor's Degree	4 (13.33)	
	Post Graduate	5 (16.67)	30
	Diploma	5 (16.67)	
	Honours Degree	1(3.33)	
	Other		
Position held in school	HOD	26 (86.67)	
	Master/Lead Teacher	4 (13.33)	30

PTD/PTC- primary teacher diploma/certificate; STD- secondary teacher's diploma; ACE- advanced certificate in educational management

In order to understand the extent of the task that HODs were faced with we also distributed questionnaires to NS teachers. This questionnaire would assist to reveal the profiles of the NS teachers that these science HODs were expected to lead (Table III and Table IV). The majority of the NS teachers in the study were female (56.30%). A few teachers (12.50%) indicated that they were senior teachers in their schools. Although most teachers were qualified either with a secondary education diploma or degree, there was 7.14% teachers who were not qualified to teach at the secondary school level at all.

TABLE III
QUALIFICATIONS OF TEACHERS

Qualification	Number
Matric	3
PTC/D	5
STD	17
ACE	20
B DEG	24
Postgrad	32
Unqualified	2
No response	9

TABLE IV
QUALIFICATIONS OF TEACHERS

Position	Number	Gender	number	%
Senior teacher	14	Male	41	36.60
Teacher	90	Female	63	56.30
No response	8	No response	8	7.10
Total	112		112	

Even those (28.57%) that had post graduate qualifications, 12.5% of them had qualifications which were not related to science teaching. Table 5 displays the age and institution where teachers had qualified.

TABLE V
INSTITUTION OF PROFESSIONAL QUALIFICATION AND AGE RANGE OF TEACHERS

Institution	<25 yrs.	25-29 yrs.	30-39 yrs.	40-49yrs.	50-59yrs.	60 +yrs.
College	0	0	8	31	8	1
University	8	4	18	14	4	0
Unqualified	0	0	0	1	0	1
Total (14 none response)	8	4	26	46	12	2

A majority of the teachers, 53.57%, were 40 years and older while 42.86% of them had qualified from Colleges of Education and not from the universities. This meant that they had a 3-year qualification as opposed to those who qualified at universities with a 4-year qualification. About 10.71% of the teachers were younger than 30 years and they had all qualified from universities.

Table 6 shows that over a third of the teachers had less than five years of experience teaching grade 8 (38.40%) and 9 (33.93%) NS respectively. Over a third of the teachers (42.00%) taught PS grade 10, over a quarter (26.79%) taught grade 11 and less than a quarter (16.07%) taught grade 12 PS.

TABLE VI
TEACHING EXPERIENCE OF TEACHERS. NS- NATURAL SCIENCES; PS –PHYSICAL SCIENCES

Years of experience insubject	Grade 8 NS	Grade 9 NS	Grade 10 PS	Grade 11 PS	Grade 12 PS
1-2	23	18	15	9	5
3-5	20	20	14	10	5
6-10	22	22	6	4	4
>10	17	17	12	7	4

The Size of the Departments

The science departments in various schools would differ in size and member subjects.The size of the department would indicate the magnitude of the management and support that the HOD needed to provide. Most schools of HODs who responded had science departments with less than ten teachers. The minimum number of teachers in the department was three in an independent school and the maximum number was 24 in a former model C school. There were a few schools (10%) that had more than ten teachers in the department.

Just over half of the teachers in the study had specialised in life sciences which covers a quarter of the NS syllabus (Fig. 2). About 45.5 % of the teachers had specialised in physical sciences which covers half the syllabus. There were 16.9% of the teachers who were not qualified to teach any of the sciences. Almost two thirds of the teachers were comfortable to teach all the NS disciplines.

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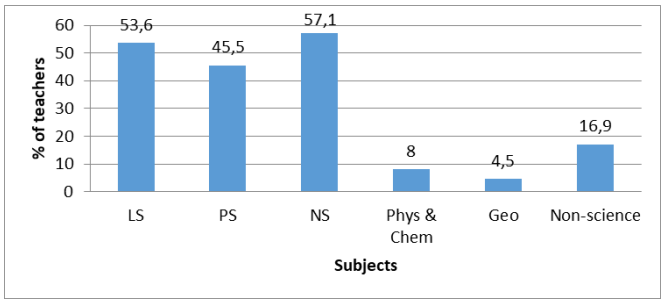

Fig. 2 Teacher specialisation

Specialisation Limitations

NS is a multidisciplinary subject comprising five science sub-disciplines. NS teachers were expected to have relevant specialisation to teach all NS sub-disciplines competently. This, however, was most unlikely because teachers could only specialise in one or two of the science disciplines. The partial specialisation or lack of science specialisation by NS teachers implied that the science HOD, as subject leader, had to develop that expertise. The data from the sampled schools showed that NS teachers in the schools had only specialised in some of the science disciplines and not all. The Sheba school HOD said, "*The other one is qualified in life science that is her major subject".* The Promise school HOD related his situation saying*, "*So it *means that for physical science we are only two with physical science, the rest they are life sciences".* He continued, "*…because first terms is more of life sciences so they don't have a problem with that part but second and third term is physics and chemistry so that's where they have a little bit of a problem".*

In Fhutura it was a similar case.

The other one is teaching NS and she specialised in life science and mathematics. That is why she is struggling when it comes to physics and chemistry (HOD).

In some cases schools did not carefully consider who they allocated to teach NS. In this school an Afrikaans teacher was allocated NS.

The other one when Afrikaans was disbanded then he went into life sciences and now NS (HOD, Sheba).

In Mooredale School a Life Orientation teacher had volunteered to teach NS.

Okay one volunteered to try something different this year [teach NS] and she has enjoyed it – that was the LO teacher (HOD, Mooredale).

In Knowledge School the teacher was not even qualified to teach at a secondary school. The HOD confirmed saying; "*The one who is teaching grade 8 has PTC [Primary Teachers Certificate] but she is going for upgrading".*

HODs are aware of this challenge and have devised ways of mitigating the challenge posed by the specialisation of teachers in NS teaching. In Promise School the HOD delegates support to one of the teachers.

The other physical science qualified is working with the grade 8 teachers, supports them in terms of the physical science and I am dealing with grade 9s (HOD, Promise).

In the Sheba School for some time, before the new curriculum they allowed the teacher to teach what she/he specialised on. That meant that the learners would not cover the whole syllabus in that particular year.

This one teaching grade 8, he is more life sciences, so if he can like give these learners a good base on life sciences, then in grade 9 we don't give him so much of the classes; we give somebody who is part of physics and chemistry. That did work for some time but now this year they took away the lady who was more physical sciences, who could teach grade 9 now (HOD, Sheba).

Whereas schools could get away with is arrangement with the old syllabus, as described by Sheba School HOD, the HOD from Promise School also realised that not covering the whole syllabus to accommodate teachers' specialisation as in Sheba School would not work anymore with the new curriculum which specifies content for each term.

I thought that maybe this time the people who are good in life sciences they deal with the life science part and those who are good in physics deal with the physics part but it's not going to be very possible (HOD, Promise).

Due to the shortage of well-rounded NS teachers (in terms of specialisation) or the availability of teachers to share the teaching of the subject, this practice meant that learners in these schools were only taught life and living (25%) for the whole year in grade 8 and would be taught matter and materials; energy and change (50%) for the whole year in grade 9 depending on the availability of the PS teacher.If the PS teacher was moved this meant that the grade 8 group would not do PS in two years and only met it in grade 10. As described by the Sheba School HOD, HODs did not allocate teachers in their departments and that frustrated their plans.

The challenge with specialisation was not about teachers alone. HODs themselves had specialisation challenges. Figure 3 shows the specialisation of the 30 HODs that participated in the study. Figure 3 shows that almost half the number of HODs (12) either did not have a physical or life science specialisation and almost a third had a mathematics specialisation. Those without a life sciences specialisation would not be comfortable to teach 25% of the NS syllabus and those without the physical sciences specialisation would not be confident to teach 50% of the syllabus. At the same time HODs could not be specialists in all 5 or 6 science disciplines themselves. They were likely to support teachers only in the areas of their expertise.

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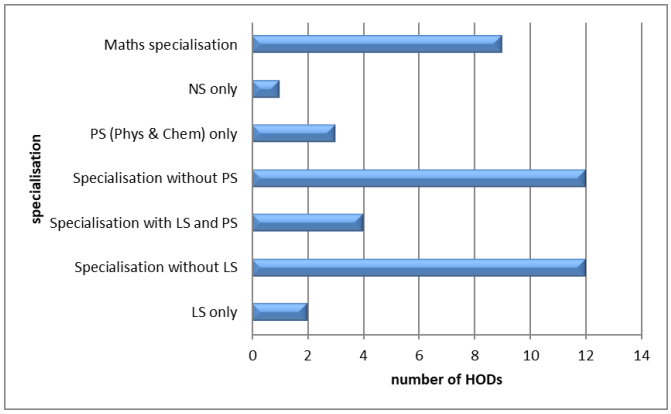

Fig. 3 Subject specialisation of HODs; LS-life sciences; NS- natural sciences; PS –physical sciences

HODs that had not specialised in the sciences could request the senior teachers in the subject to assist them with monitoring the said subject. This provides an opportunity for shared or distributed leadership as advocated by Spillane *et al*. (2004) and Ng *et al*. (2015). This also supports the submission of Mestry (2017) who opined that instructional leaders should forge partnerships with other teachers as colleagues by spending more time in classrooms and engaging teachers in conversations about teaching and learning.

HODs as a Teacher

HODs are both subject teachers and leaders. Subject teaching takes priority and the department policy specifies that they spend 85% of the time teaching. This leaves only 15% of the time to do other work. The HOD duties demand more time than can be allocated. Figure 4 shows information on the extent to which HODs spend their time teaching and its effect on the NS instructional leadership.

Eighteen HODs (60%) were actually teaching the subject (Fig. 4). These HODs would understand the subject challenges, prove to have the needed subject expertise and be in a position to work with the teachers in the subject instead of working for them. The HODs did not only teach NS but they also either taught physical or life sciences or mathematics. The number of HODs who taught physical sciences (12) was almost equal to the number of those who taught life sciences (13).

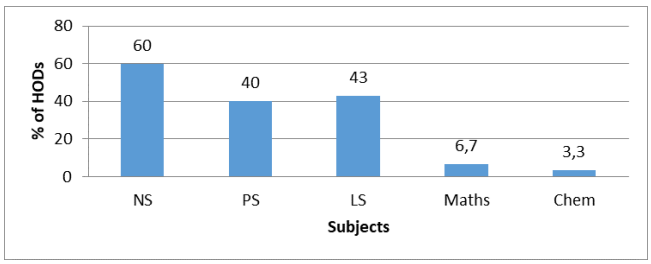

Fig. 4 Subjects taught by HODs

Mooredale School HOD did not even teach any of the science disciplines and she said; "*My specialisation is Maths. I don't actually teach NS".*

The Sheba School HOD reported that he taught the subject on a relief basis and said: "*No, I taught it up to I think the end of the first term. Not this term. I taught it on and off sometimes, depending with the staffing."*

The HOD from another school used to teach the subject and was more conversant with the subject. This, however, was before the new curriculum.

I used to teach NS, so I knew where the problem was, the Bloom's taxonomy wasn't followed, so I knew. So most of the time what I do is we will do a management plan (*HOD, Knowledge*).

During data collection she was only teaching LS which is only one science discipline. Even, then, she was only teaching the senior secondary learners.

No, I am not teaching NS. I am teaching grade 10, 11 and 12 life sciences (HOD, Knowledge).

The Fhutura School HOD confirmed not teaching grades 8 and 9 and said; "*I am teaching 10, 11, and 12 only".*

These HODs had a sizeable workload of teaching and some of them had release time to do their HOD work. We discuss other HOD responsibilities later in this paper.

If you look at those periods, it is three classes. PL 1 teacher might have 6, so it gives me some free time to look at this admin work that you do. And sometimes you can have those four or five classes also, if the manpower is not balanced in the department, then you must find time after hours, leave this place around 4 or 5, so that you push your work (HOD, Sheba).

The Promise School HOD was confident that he had some release time to do HOD work and said; "*I do have time to do my duty".*

HODs as a Manager and Administrator

HODs are expected to monitor subject instruction and quality against assessment standards and provide report to the school leadership (Wanzare, 2013). There were various ways that individuals at different levels adopted to monitor instruction. To do this the HOD needed to be aware of and up to date with subject curriculum developments. Sheba School HOD reported weekly monitoring of learner books.

You monitor on a weekly basis, where you send through the learners work and the educator completes a template to say they have done 1-2-3 for that week. So you compare what they say they have done with what is in the learner's book.

Promise School HOD mentioned that they did monthly learner's workbook moderation.

Let's say once a month I moderate learners work. I sign and then sometimes I stamp them just to check and then look at the quality of the work, the number of activities they've been given.

The Sheba School HOD also emphasised the stamping of learner books saying; "*You have to sign and stamp them to acknowledge that you have gone through their book and then make the relevant comments in the teacher's report to say' is the work okay, do you need support?".*

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The Knowledge School HOD mentioned more areas that she monitored other than learners' books.

So from there I will write the monitoring tools, files must be in order, learners books must be in order, from there even the work schedule must be finished.

Mooredale School HOD used subject meetings to monitor and said*; "Alright so basically what we do is have a meeting once every two weeks just to check that everybody is in the right place".*

Glickman *et al*. (2011) emphasise the possession of interpersonal and technical skills and knowledge in order to be sensitive to teachers who are supervised.

Subject Meetings

Subject meetings were one of the organisational routines that schools used for teachers teaching the same subject to have instructional interaction. However, the attendance, frequency, content, management and outcome of these meetings vary from schools to school and are dependent on the organisational infrastructures of the school. Below we present findings on how subject meetings are managed in the sample schools. Although not all HODs mentioned meetings as means of monitoring all schools held subject meetings even as compliance activities. Sheba School HOD termed them (subject meetings) mandatory saying; "*Mandatory we must have a meeting every term or every month".* These meetings were planned for the year at Promise School.

My plan is to have a departmental meeting at least once a term and then at least one subject meeting per subject which means it's going to be 3 subject meetings (HOD, Promise).

However, other priorities competed with the subject meetings.

No, this term we haven't had the meeting yet. We were busy doing all the submission and other stuff so that was the biggest problem; I don't have a meeting this term yet (HOD, Promise).

Content of Meetings

We asked the HODs what they discussed in the department meetings.The questionnaire results from 30 school showed that the most frequent item discussed at meetings were assessment issues and content coverage (Table VII). This was confirmed by the semi structured interview data we collected from the six HODs. The Promise School HOD mentioned that his meeting aim was the curriculum report.

The main thing that I need is report in terms of syllabus covering, the number of SBAs per term and then I also give them a report on the quality of work that they give learners.

The Sheba and the Mooredale School HODs had a similar meeting agenda.

Firstly is curriculum delivery, secondly is any interventions we need to put in place, and thirdly upcoming events, we are going towards exams or just beginning the term, what we expect on that term or that year. We also discussed circulars from the district, are we in line with that circular? (Sheba).

…what we do is have a meeting once every two weeks just to check that everybody is in the right place (Mooredale).

TABLE VII
FREQUENCY OF ITEMS DISCUSSED IN SUBJECT/DEPARTMENT MEETINGS

Discussion frequency at meetings		**Mean**	**S.D**	Rank
1)	Policy reviews	3.267	1.596	13
2)	Clarification of the department's direction	3.8	1.127	11
3)	Textbook and course-material reviews	3.967	1.098	7
4)	School improvement plan	3.9	1.242	9
5)	Instructional evaluation	3.833	1.117	10
6)	Professional development	2.833	1.599	14
7)	Curriculum and learner outcomes	4.233	1.006	4
8)	Learner-assessment issues	4.533	0.860	2
9)	Question-paper monitoring	4.633	0.718	1
10)	Analysis of learner scores to inform instruction	3.533	1.456	12
11)	Start- and end-of-term issues	4.167	0.913	5
12)	Budget	2.6	1.379	16
13)	Development and sharing of lesson plans	2.667	1.539	15
14)	Account of the term's work or content coverage	4.4	0.969	3
15)	Distribution of leadership activities	3.933	0.944	8
16)	Plan of next remedial or enrichment steps	4.033	0.809	6

The teacher from Alpha School reported a different story. Her HOD was a mathematics specialist. She said, *"When we meet as a department it is not only NS teachers. We meet with maths teachers and we only discuss administrative issues, learner discipline and the files and records that we should keep (Teacher 1, Alpha).*

Sometimes meetings tended to focus on assessment requirements and deadlines.

Initially, at the beginning they were not up to standard, but after we had designed the tool for setting the question paper, they are coming alright. We look at the results, check problem areas, how do we do intervention programs, diagnostic analysis, and feedback from the subject advisor (HOD, Knowledge).

The Mooredale School HOD concurred saying, *"we normally just follow up to see if there is assessment coming up that everybody knows what it is on."*

Schedule and Duration of Meetings

Almost all schools that we followed up with semi structured interviews held their meetings during the lunch hour. The meetings were very short as teachers took time to gather from the respective classrooms.

We try to meet about twice a term. The meetings are during lunch time or after school. There is a departmental office where we meet (HOD, Sheba).

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The Mooredale School HOD also preferred lunch break meetings saying; "*I found that break was the most effective way to get them all at the same time".*

However, one school indicated that it had its department meeting during the sports period instead of during the lunch hour.

The meetings are usually on Wednesday during the sports period (Teacher 1, Alpha).

The HOD from Fhutura School also indicated that the lunch time was usually too short to discuss any detail and they sometimes used time after school hours to complete the meetings. He said, "*Nowadays we normally hold meetings during lunch time. If maybe you find that during lunch time we couldn't exhaust the agenda we normally adjourn to half past two, after school".*

Frequency of the Meetings

Almost all schools held their department meetings once a term, although they tried to have them more frequently.

My plan is to have a departmental meeting at least once a term (HOD, Promise).

The HOD from another school confirmed saying: "*Mandatory we must have a meeting every term" (HOD, Sheba).* They sometimes did not even meet at all due to other pressing issues. The Knowledge School HOD mentioned that meetings were flexible.

Subject meetings we do as often as possible, maybe if Mr Lato comes with some issues that need to be discussed, then we do diagnostic analysis of the question paper, just to see.

The Fhutura School HOD concurred*, "Subject or department meetings do not always materialise as planned. Because we have GET [General Education and Training] and FET [Further Education and Training] teachers mixed when we discuss GET matters FET teachers tend to get bored (HOD, Fhutura).* The teacher from Alpha secondary school also emphasised the flexibility of the year plan as far as department meetings were concerned saying, "There *is a year plan but things just occur but they are flexible. The plan is changed for emergency issues".*

Mooredale School HOD clearly distinguished between subject and departmental meetings

We normally have a department meeting once a term, the whole lot together, I just found that it is sometimes if you are only working with the NS then it is a bit much to sit through everybody else's issues, and certainly at the beginning of the year we have a big one, everybody altogether…Alright so basically what we do is have a meeting once every two weeks just to check that everybody is in the right place.

Classroom Observation

Classroom observations are powerful tools to gain understanding of what goes on during the interaction between the teacher and the learners about the subject. They can be time consuming because of the size of departments in schools. If not properly planned and their purpose is not well understood they could be deceiving because the teachers could mask their inadequacies during the observations. When working well they could be used to identify areas of strength or development. Not all sample schools did classroom observations and they were not uniformly welcome in all schools.

All schools indicated that they did classroom observations. The follow-up interviews revealed that these were done for Integrated Quality Measurement Systems (IQMS) purposes.

We do classroom observations, sometimes primarily for purposes of IQMS (HOD, Sheba).

The Promise School HOD confirmed saying, *"Normally the only class visits that we do is for IQMS because that one is basically a must".* Fhutura School HOD concurred*, "I normally do that in the name of IQMS".*Mooredale School used time as an excuse for only doing IQMs class visits saying*, "Normally we do them when we do the IQMS. It is difficult to fit that [other class observations] at the same time. Yes, because there are about 12 of them so to get through everybody takes a long time".* Alpha HOD also concurred*, "I do classroom observations under IQMS in the 2nd and 3rd quarter and provide feedback".*

The Promise School HOD also reported that some teachers were not comfortable to be observed, saying: *"No I haven't done the plan for class visits. I wanted to put it in my management plan but I decided to remove it because most teachers they don't want to be visited in class. We had another meeting where we discussed that, so I cannot visit the teachers who do not want to be visited".* The HOD from Sheba School concurred saying*, "If classroom observation is unplanned union issues come to play".*

Smith *et al.* (2013) warn that teachers might see observation as a demonstration of lack of trust in them which is replaced by surveillance (p S170). The responses from all teachers in the study showed that HODs did classroom observations and provided feedback even though it was ranked 6th (Table VIII) and the HODs occasionally allowed observations in their own classrooms (ranked 10th).

TABLE VIII
FREQUENCY OF INSTRUCTIONAL LEADERSHIP PRACTICES

Frequency of IL practices N=112		**Mean**	**S.D.**	**Rank**
1)	Discusses teaching of a particular concept with the staff	2.293	1.209	12
2)	Works with my department to prepare teaching material	2.317	1.193	11
3)	Visits other teachers' classrooms to observe their teaching	2.415	1.203	9
4)	Allows informal observations in his/her own classroom	2.366	1.337	10
5)	Does classroom observations	2.683	1.171	6
6)	Provides regular and useful feedback/suggestions on my teaching	2.976	0.987	3
7)	Monitors and controls learners' activity and assessment books	3.219	0.962	1
8)	Monitors subject content coverage	2.707	1.229	5
9)	Carefully tracks learners' academic progress	3	1.096	2
10)	Knows what is going on in	2.61	0.946	7

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	science classrooms			
11)	Actively monitors quality of science instruction	2.83	1.202	4
12)	Works directly with teachers who are struggling to improve instruction	2.61	1.263	7
13)	Leads professional development sessions in which you participate in	2.195	1.345	13

Response scale:0=Never, 1=seldom, 2=occasionally, 3= frequently, 4= always

However, classroom observations were diagnostic and developmental in some schools. The HOD below described how she identified a need during classroom observation and then arranged help for the teacher that was observed.

It was an experiment about the acids and bases so I found the other teacher for Grade 8 was not that well equipped with the knowledge, so I said this other one must go and help her (HOD, Knowledge).

Other HOD Duties

HODs got allocated other management and administrative duties to perform over and above their teaching and monitoring the subject instruction. They found that IQMS was time consuming and did not justify the amount of time involved.

They belonged to a myriad of committees ranging from social, fundraising, sport, LTSM, timetable to being cluster leaders for the subject. The Sheba School HOD listed school committees he belonged to and other administrative work that he had to do over and above being a HOD.

You become part of the exam committee, the LTSM committee which procures the books and the materials, etc. You can also be the teacher component of the SGB, where I am the secretary of the SGB. And then I am also responsible for taking the school stats, from day 1 up to day Z of the year, you take your registers, (and tally attendance).

The Mooredale School HOD explained the whole school leadership approach adopted by her school and said:"*I am head of grade 10 so I deal with grade 10 behavioural issues, phoning parents. I do extramural activities; I have got athletics, hockey and award ceremonies".*

Institutional Support for HODs

HODs performed a lot of duties within and outside their specialisation. We investigated if they had received any leadership training on the work that they were doing. They responded that they had not received any formal training or professional development. The Sheba School HOD responded, *"Here I haven't received training but we do go for the HOD workshop, and we are taught these are the instruments that you use".* The Knowledge School HOD from a different district confirmed that they had a common workbook but they had not received any training.

We have got at the moment a common work book for them, so the work is kind of set out, and if somebody does an extra thing then they will share it with the others.

HODs had not been trained to lead or manage departments except being trained as teachers. They reported that balancing available time with administrative work was difficult. They found that personnel issues, finding time for action research and dealing with school management and administration were the most difficult issues to handles. Managing subject finances was voted the least difficult and was never discussed in subject meetings either (Table IX).

TABLE IX
ISSUES IDENTIFIED AS DIFFICULT TO HANDLE

Difficult issues to manage	Mean	S.D	Rank
1) Staffing issues	3.2	1.540	1
2) Bureaucracy/ Dealing with school management and administration	2.833	1.440	3
3) Managing subject finances	2.3	1.236	7
4) Finding time for action research	2.967	1.519	2
5) Analysing learners' scores	2.4	1.453	6
6) Managing with inadequate resources	2.7	1.489	5
7) Time management	3.767	1.407	4

Subject Advisor Support

Subject advisors are stationed in the local district offices to provide specialist subject instructional support to a group of schools. Their services are available to schools but they are not mandatory. Figure 5 shows the responses from sampled schools on the support they received from subject advisors. We wanted to know where their source of support was. The principal was voted the most helpful person (40%). The deputy principal and the subject advisor were also equally voted as the next helpful persons.About a third of the HODs were modest about the helpfulness of the subject advisor though.

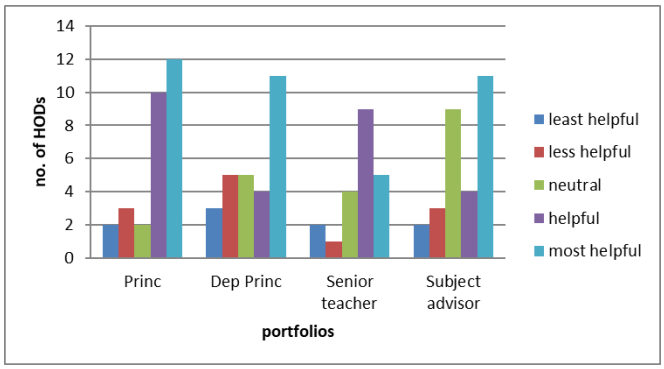

Fig. 5 The most helpful person to the HOD

There was an association between the extent of helpfulness of the district subject advisor and the level of support that was received from the subject advisor (p=0.001). Subject advisors supported schools in many different ways. The local district subject advisor supported the schools by providing some common teaching and assessment material (Table X).

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TABLE X
HELPFULNESS OF THE DISTRICT CURRICULUM SPECIALIST AND FULL SUPPORT FROM SUBJECT ADVISOR

Variables	**I have the full support of my subject advisor**				**P-value of association**
Extent of helpfulness of the district curriculum specialist	Dis agree	Neutral	Strongly Agree	Agree	
Least helpful	0	0	1	1	
Less helpful	1	1	1	0	
Averagely helpful	1	4	2	2	
More helpful	1	0	1	2	
Most Helpful	0	0	0	11	
Total	3	5	5	16	0.001

This, the Promise School HOD acknowledged and said: "*Yeah, control tests normally come from the district".*

Another way in which subject advisors supported the schools was with different kinds of workshops varying from content knowledge to action research. Sheba School HOD confirmed and said:"S*he does visit us; we do hold workshops with her.* The other HOD also concurred.

Yes there are workshops wherein they (district) will be giving us feedback on the learner's performance and then they will be teaching those topics that we need attention (HOD, Knowledge).

Content knowledge was also attended to at the district cluster meetings with subject advisors.

So they do that on a topic because when they visit they will ask 'do you need any help?' And if there are many people who need it then they will do it (HOD, Knowledge).

The other means of support were reported by the Sheba School HOD when he said: *"Support from subject advisor is wonderful, I think we can communicate with them every minute that we want. We have a science WhatsApp group that takes care of our life sciences, PS, NS".*

The Promise School HOD, though, revealed that the subject advisors only paid attention to FET subjects saying, "…they *did come to visit but only for FET, they didn't come for NS".*He went on to mention that even the meetings that subject advisorsarranged were only for FET teachers and he said*, " the cluster meetings for teachers we had one yesterday but it was for FET only".T*he Mooredale School HOD confirmed saying*, "No, they don't do it for NS, the FET has. We had a cluster meeting but it was for the FET section, not the NS, they do neglect the middle. At the beginning they are beating everybody into shape, but the middle doesn't matter."*The Alpha School HOD concurred and said*, "We do get material from the subject advisor but only on the FET side, not GET".*

It was evident that subject advisors were somewhat supportive but more to the teachers (the teaching of the subject) than the HODs (the curriculum management). We then explored the extent to which HODs engaged with the HODs. The Sheba School HOD reported that he attended the workshops organised by subject advisors even though he did not teach NS at that time.

Even though I am not teaching the subject, I have to attend. I remember spending a day in NS, where we were doing the experiments, and by then I was not teaching.

The Mooredale School HOD had a different view point about her engagement with the subject advisor.

Ja, I think so, I don't have as much contact with them because I don't attend those cluster meetings. But certainly if teachers wanted to know something they could get hold of him (subject advisor).

The Alpha School HOD also reported that he did not attend workshops planned for NS teachers and said, *"I do not attend NS workshops, I request the subject teachers to attend".*

Principal's Support

The HODs were also asked to rate the extent of the support that they received from the principal. The support was categorised into specific areas like provision of space, time and resources to do instructional work, buffering the school from outside influences and different forms of encouragement.Principals were rated helpful on average by HODs from all types of schools. However, some HODs found them to be either less helpful (10%) or were neutral (6.7%) about the kind of support that they received from the principal. When the HODs were interviewed the Mooredale School HOD said, "*She is very supportive. If you need to discuss something with her you can go and talk to her".* Table XI shows the specific areas where HODs found principals to be supportive or not.

TABLE XI
HELPFULNESS OF THE PRINCIPAL AND THE ABILITY TO DEAL EFFECTIVELY WITH PRESSURE FROM OUTSIDE THE SCHOOL THAT MIGHT INTERFERE WITH TEACHING

Variables	**The principal deals effectively with pressure from outside the school that might interfere with teaching**					**P-value of association**
Extent of helpfulness of the principal	Strongly Disagree	Disagree	Neutral	Strongly Agree	Agree	
Least helpful	1	1	0	0	0	
Less helpful	0	1	1	0	1	
Averagely helpful	1	0	0	1	0	
More helpful	0	1	0	8	1	
Most Helpful	2	1	0	2	7	
Total	4	4	1	11	9	**0.002**

There was an association between the extent of helpfulness of the school principal and his/her ability to deal effectively with pressure from outside the school that might interfere with teaching (p=0.002).However, schools strongly

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disagreed that they received support from principals in terms of space and time to carry out their duties. This was evident in the HODs using their lunchtime for meetings.

There was an association between the extent of helpfulness of the school principal and the provision of space and time for departmental activities (p=0.033).All township and informal settlement schools that we followed up, except the former model C school, Mooredale, held their meetings in the HOD's offices. These were not proper offices but usually store rooms behind the laboratories. The HODs indicated that the principal could have been more helpful to provide space for the HODs to conduct their meetings (Table XII) instead of using the cramped offices or classrooms. The Mooredale School team held their meeting in one of the classrooms.

TABLE XII
EXTENT OF HELPFULNESS OF THE PRINCIPAL AND PROVISION OF SPACE AND TIME

Variables	**The principal provides space and time for departmental activities**				**P-value of association**
Extent of helpfulness of the principal	Strongly Disagree	Disagree	Neutral	**Strongly Agree**	
Least helpful	0	1	0	**1**	
Less helpful	0	1	2	**0**	
Averagely helpful	0	0	1	**1**	
More helpful	1	1	2	**4**	
Most Helpful	0	2	0	**2**	
Total	1	5	5	**9**	**0,033**

Arrangement of Subject Departments

One of the ways principals could support HODs was by arranging and resourcing the departments optimally to support instruction. The Knowledge HOD explained how the NS department was created in her school.

No, he wasn't giving us that full attention because he was not life sciences or NS. When it comes to problems for NS or PS you must go to other schools .So most of the time we didn't get answers direct from him, we will get admin answers, but curriculum related questions were not fully answered so I think that was the reason it was divided into two departments.

Regarding resourcing the departments for optimal NS instruction the Fhutura School HOD said, *"Yes. I have an NS educator. She didn't specialise in Physical Science. She didn't specialise in any science subjects like Life or Physical Sciences. She was teaching Physical Science in Grade 12, hence the results were 9%. She qualified in Geography and she is teaching NS Grade 9. She is also teaching mathematics.* He continued saying*: "The other one is teaching NS and she specialised in Life Science and mathematics. That is why she is struggling when it comes to physics and chemistry".*

Sometimes the proper handover from one HOD to the next did not happen in the schools. This is supposed to be facilitated by the principal and his deputy. The Promiseschool HOD reported this challenge saying**, "***I did prepare one and then the person who was acting said that most of the things are his there and then I had to start from scratch for senior phase there was nothing ….I didn't even have a mark sheet, I didn't have a work schedule".*

From the data it is evident that science HODs looked to the principal for support especially with the school conditions and contextual factors in order for them to provide effective instructional leadership.

Apparatus and Laboratory Facilities

Facilities and science equipment are some of the most important resources for science instruction. The principals as school leaders had the duty to provide these as a demonstration of the capacity of the school to support learning. The challenge is that these facilities are expensive to purchase and maintain. Most sampled schools did not have laboratories and where they had they were poorly equipped and HODs had to borrow from other schools.

Our school is a little bit poor in terms of the apparatus required for practical investigation, sometimes we go out. I go out and borrow some practical from the neighbouring school and then from there I bring them here, demonstrate them how to perform them in front of learners before they go to class (HOD, Promise).

The Sheba School HOD concurred saying*, "Like now when you phoned I was supposed to go to one school there and just borrow a few burettes for our practicals for the grade 12s".*

The HODs reported that although it was important to take and control stock especially in science classrooms and laboratories, they found it extremely difficult to manage the department with inadequate resources, both financial, physical and human resources (Table XIII).

TABLE XIII
IMPORTANCE OF TAKING AND CONTROLLING STOCK AND DEGREE OF DIFFICULTY OF MANAGING WITH INADEQUATE RESOURCES

Variables	**Degree of difficulty of managing with inadequate resources**					**P-value of association**
Importance of taking and controlling stock	Least difficult	Less difficult	Averagely difficult	More difficult	Most difficult	
Least important	5(62.5)	2 (25)	0 (0)	0 (0)	1 (12.5)	
Less important	0 (0)	0 (0)	2 (66.7)	0 (0)	1 (33.3)	
Important	1 (12.5)	1 (12.5)	1 (12.5)	4 (50)	1 (12.5)	
More important	1 (50)	0 (0)	0 (0)	0 (0)	1 (50)	
Most Important	1 (14.3)	0 (0)	0 (0)	1 (14.3)	5 (71.4)	
Total	8	3	3	5	9	0.01

Science HODs perform a number of duties as expected by their school leadership ranging from compliance activities where they just tick the box to going out of their way to borrowing laboratory equipment from other schools. They had never been trained professionally or developed to

perform their management duties. In some districts, their teachers receive support from subject advisors but there is no support for them. Some principals support the HODs while some principals do not even consider how they staffed the departments for optimal NS instruction.

Minimal influence over teaching and learning

Both the literature and education policy in South Africa view the HOD as a person who has strong professional, pedagogical, and subject matter knowledge that is underpinned by experience in teaching the subject (Smith *et al*., 2013). Experience in the subject is gained by teaching it and understanding areas where learners are likely to meet challenges. With the changes in the curriculum, teaching the subject becomes crucial, as one gets to understand the areas of difficulty in the subject. In this study, just under half of the HODs actually taught NS or knew what was going on in the subject. The findings show that they are not familiar with the subject matter and do not understand the grade expectations. These HODs are mostly teachers of senior secondary subjects like PS, LS and mathematics. They have expertise in these subjects and would therefore dedicate most of their time to it. This presents the conundrum of managing in the middle (Koh *et al.,* 2011). While they have expertise in the subjects that they teach, they could not meet the NS teachers' subject specific needs or expectations of support because they themselves are not sure of the subject demands. The findings suggest that in general, the HODs' influence over instructional practice is very weak, even when the various contexts were taken into consideration.

The focus on compliance to meet role expectations

The conundrum of managing in the middle is further revealed in how the HODs understood and managed their roles. In order to meet role expectations as prescribed by policy, the HODs focused on compliance activities when monitoring the subject instruction. Compliance activities centred around the administrative work (Bush, 2013) related to their subjects and included conducting regular subject meetings; monitoring the coverage of syllabi; checking teachers' files; and moderating learner workbooks and test papers. There was very little evidence of how all these activities related to analysing and improving learner performance; and improving teaching practice. In other words, the work of the HODs in many instances involved 'ticking the boxes' to show completion of their tasks rather than any meaningful and substantive engagement with the core teaching and learning processes at the schools, and how these could be improved.

The HODs could not provide effective support and leadership as described by Lashway (2002) in the form of professional development, classroom observation, mentoring and coaching. Considering the profile of the teachers in their departments and the changes in the curriculum, the teachers needed very visible and available leadership. They required continuous professional development and support even in the classroom. It was revealed that classroom observations are only done for IQMS purposes, and the HODs do not diagnose other challenges or identify examples of best practice. The findings reveal that teachers needed support particularly on the development of SBATs. This support involved not only developing the tasks, but tasks that were customised according to 1) the availability of apparatus in the school; 2) the ability of teachers to perform the various experiments; and 3) the ability to assess the tasks meaningfully.

The findings suggest that the focus on compliance was related to a number of factors:1) Lack of release time (Brown *et al.,* 2000); 2) pressure from the top leadership to submit reports (Glickman *et al.,* 2011); and 3) their own teaching in the FET band. The HODs were fulltime teachers and did not get release time to focus on their instructional leadership duties. Yet, in order to fulfil their roles as HODs, they have to show evidence regarding their activities, which in most cases takes the form of reports to the school principal. The compliance focus also raises interesting questions about how far the schools have progressed in moving from a bureaucratic style of management to focusing on instruction as the core activity of the school. The findings of this study suggest a predominance of the bureaucratic impulse for compliance, and highlight some of the organizational, contextual, personal, and professional constraints to more effectively managing and leading the teaching and learning processes in the school.

Curriculum coverage

Another factor that has made managing in the middle a challenging task is the qualifications of HODs. Some science HODs did not have a science qualification or specialisation. This meant that besides lacking content and pedagogic knowledge, they could also not provide effective instructional guidance in specific science subjects. To save themselves from embarrassment they would allow teachers to do what they could and would not query any discrepancies in the syllabus coverage (Wanzare, 2013).From our research, it could be inferred that this is also the reason why they 1) did not do classroom observation (because they might find a teacher who knows more than them in that subject); and 2) did not do professional development, mentoring and coaching (because they did not have the necessary subject expertise). In at least two out of the six schools that we interviewed, the science departments were led by mathematics specialists.

Furthermore, in the old syllabus, teachers would be allowed to only teach what they specialised in. They could get away with it because the grade 8 and 9 instruction is not monitored and there is no standardised assessment. If, say the grade 8 teacher is a LS specialist, learners would be taught only the "life and living" strand in grade 8 with the hope that they will get a PS specialist in grade 9. This was not a guarantee in the schools as the grade 9 teacher could be the same teacher or another teacher with only LS specialisation (as in Sheba School). This is partly because there is a shortage of PS teachers in the schools (Kriek & Basson, 2008). Curriculum coverage is thus a major challenge in certain science subjects. These learning gaps

accumulate over time, leading to difficulties in the subjects in the higher grades, and could be one of the contributing factors to the high drop-out rate in grade 10.

Restrictive Organizational Arrangements in Schools

Subject departments in most South African schools are for a group of subjects and not one subject. The arrangement of subject departments is often determined by the social contexts of schools and the availability of resources (Spillane & Hopkins, 2013). Schools with better finances would have more HODs or even senior teachers to assist with instructional support. However, the arrangement in most of South Africa's public schools is such that subjects like mathematics, mathematical literacy, technology education, natural, physical, life and agricultural sciences (where applicable), all belong to one department. It is highly impossible for one HOD, who also teaches, to be a specialist in all these subjects, have separate subject specific meetings, and address subject specific issues. The meetings as reported by the HODs were short (about an hour at most) and in some cases it happened during the lunch break. The HODs responded to these restrictive conditions by only discussing administrative issues and sharing information that was needed to produce the departmental report.

The organizational arrangements in schools thus appear to neglect the NS as a key foundational subject and the NS teachers as important in laying a good foundation for the four senior secondary school subjects. The school structures do not enhance the school's capacity to support learning or provide an enabling environment in which science teaching can be strengthened through effective instructional leadership that is exercised by the HOD.

Lack of School and District Support for the HOD

The findings reveal that the principals do not support the HODs or make an effort to make their jobs easier (Klar, 2012). This is evident in the way they structure and resource the (subject) departments. Firstly poorly qualified teachers are allocated to teach NS. In Fhutura school we saw a geography teacher who was a failure in grade 12 PS (producing only 9% pass rate) being 'demoted' to teach NS. This suggests that the school leadership do not care about the foundation that this teacher would lay for the Grades 8 and 9 learners. This is not only the case in one school and seems to occur in other schools in the study. A reason for the allocation of poorly qualified could be because there has been no monitoring of the grade 8 and 9 curriculum and alignment of instruction with assessment standards.

Secondly, the principal's support is not evident in the appointment of HODs, especially those expected to lead NS. If the principals were mindful of the specialisation of the HOD and the teachers, they could have strengthened the senior teacher structure in the schools. The senior teacher would ensure subject specific support for the teachers in each subject strand (science discipline). The HOD would support the teachers in other areas that did not need subject expertise. As it is the case, the principals leave the HODs to swim or sink with whatever resources they have and they have to make a success of it.

Thirdly, the senior school leadership team in the study does not prioritise subject or department meetings and seem not to attach much importance to these meetings (Klar, 2012). Our interview data supported these findings. The HODs described cases where other activities in the school took priority and they could not find time to meet. This shows a lack of focus on the instructional mandate of the school. Subject meetings are not formalised and prioritised by the senior school leadership team, and are considered less important than extramural activities which at least are allocated time. Teachers have to sacrifice their own lunch time to attend these meetings. This is also evident in the number of times that these meetings were postponed in some schools during the data collection cycle.

Fourthly, the findings show that although the principals are supposedly supportive, they do not assist in the providing of safe and adequate space where the HODs can do their work (Naicker *et al.,* 2013). We witnessed the shortage of space for HODs in terms of meetings, professional development activities, storage and filing space. We conducted interviews in very crammed spaces which were originally laboratory store rooms. These rooms were packed with textbooks, some laboratory equipment, learners' books, and teacher files etc. In other schools we conducted interviews in the deputy principal's offices because the HODs did not have any space different from his/her classroom to hold such meetings. The only spaces to do any work with teachers were the classrooms, which they used with the learners.

The NS teachers also compete for laboratory space with the physical and life sciences teachers. The FET subjects are prioritised to use the laboratory (which is a scarce resource in the schools).The grades 8 and 9 classes are very big and to schedule their use of the laboratory is very cumbersome. This challenge is complicated by 1) the lack of apparatus to accommodate all learners (especially with regard to consumables); 2) the allocation of poorly qualified NS teachers who struggle to perform experiments to teach NS; and 3) non-specialist HODs who could not therefore support these teachers in subject specific matters.

A number of HODs mentioned that they had to go to other schools to borrow equipment. There is no evidence that the principals were actively supporting the HODs to ensure that there are adequate resources for teaching. These findings point to the lack of an instructional orientation in the schools, especially from the senior leadership team. It once again highlights the difficulties of shifting the paradigm of the school as an essentially bureaucratic institution to one that has a singular focus on teaching and learning and in which the organizational arrangements and resources are directed at supporting these two core activities.

Subject advisors are very rich resources that the department of education has to support subject instruction. The findings reveal that mostly FET subject advisors visited schools. This finding attests to the focus on FET subjects

because of the pressure exerted by the need to improve performance in the grade 12 exit examination. Although some subject advisors did come to schools, they would monitor the implementation of SBATs, which was a compliance activity.When subject advisors come to the schools they require subject files and learner books from the HOD where they check the records of the SBATs. That is about the only interaction that subject advisors had with the HODs.

Subject advisors also tend to work directly with teachers and not the HODs (unless the HOD was also a teacher of that particular subject). They invite teachers to workshops and cluster meetings but there is no evidence of the HOD specific workshop organised by the subject advisors. In this arrangement, the district system misses the very important link to subject instructional improvement - the HOD (Melville, Wallace & Bartley, 2007). Subject advisors are responsible for a group of at least 20 schools and it is not possible to be available every time the teachers need them. HODs are better placed to support the teachers because they spend more time with them (Highfield, 2010). Hence there is potential for building the instructional capacity of the HODs in order for them to effectively support and guide the work of many more teachers. By ignoring the professional development needs of the HODs, the district has missed out on an opportunity to expand and deepen the instructional focus in schools.

From the issues raised in the discussion above, we get a sense of the difficulties associated with the role of the NS HODs in schools. Very often these leaders find themselves caught between their roles as teachers and that of instructional leaders in the school that leads to tensions, conflict and frustration (Naicker *et al.,* 2013). The potential for science HODs to more effectively adopt an instructional mandate remains largely unfulfilled due to the organizational arrangements in the school; their lack of qualifications and expertise in certain subject areas; and the inadequate support provided by the senior school leadership team and the district office. All of these issues contribute to the conundrum of managing in the middle – where the HOD has to find a balance between teaching and leading, and where the latter is often made more difficult by the issues discussed above. The result of all of this is that the opportunity for the HOD to play a more effective role as instructional leader on the school's SMT and contribute to improving learning outcomes is lost. Given the current crisis of quality in our education system, the focus on supporting and strengthening the instructional role of the HOD in South Africa's public schools will require urgent attention.

IV. Conclusions

This study is located within the emerging field of research on instructional leadership in South African schools. The focus on instruction has been made more prominent by the call from policy makers, academics, and the public in general to improve educational outcomes in the country. This study aims to contribute to the literature on instructional leadership in schools by considering the role that HODs play as part of the SMT and exploring the extent and nature of their work. To date, not much attention has been paid to the important role that HODs can and should be playing in supporting and strengthening teaching and learning in schools, and this study makes a contribution to deepening our understanding of their work.

The sciences HODs occupy the middle position between the senior school leadership team and the teachers. This makes their work both complex and challenging because NS is also a multidisciplinary subject area. The HODs are expected to lead subject departments but they find themselves leading a group of subjects, some of which they have no specialisation in. They find themselves leading teachers who know more than them in some subjects. The NS and science HODs' experiences, understanding of the reality and expectations are mediated by the contextually constructed paths the schools created for them. These paths are influenced by the social context and resources available at the school; the organizational arrangements around instruction; and the support provided to the HODs by the senior leadership team at the school and the district office.

The findings of this study offer evidence that the senior school leadership does not hold NS in high regard and they do not support the HOD in working with poorly qualified teachers. NS competes with other subjects that are given a better status. The findings also reveal that science HODs do not receive subject specific support (in terms of time, space, apparatus, qualified teachers) from the school senior leadership nor the subject advisors. The HODs have devised ways of mitigating the challenges of poorly qualified or non-qualified teachers which results in learners being taught only one science discipline a year (e.g. only life sciences for the whole year and sometimes both years –grade 8 and 9). These findings further reveal that senior school leadership does not reflect on the instructional leadership provided by HODs for the purposes of development and providing feedback to the other components of the school system in order to improve instruction and learning outcomes.

The findings of the study sheds light on the role of the sciences HOD in the schools, and highlight both the importance and constraints of the role. As very little research has been conducted in this area to date, the study makes an important contribution in deepening our understanding of how the work of the HOD fits into the broader school effectiveness discourse and literature in South Africa. School principals and deputy principals, on their own, will not be able to transform their schools and successfully embark on improvement initiatives. What is required is "distributed" leadership that stretches across the school and is centred around common improvement goals. The HODs are central to this paradigm of instructional leadership in the country. In essence, the findings suggest that the schools were still operating within a bureaucratic paradigm that focused on management for the sake of compliance, without any explicit connection being made to how these management practices related to and supported teaching and learning in the schools. The findings of the study give rise to a few

recommendations for how the work of HODs can be more effectively supported in schools.

Firstly, from a systemic perspective, the department of education and the senior leadership teams in schools should relook at the arrangement of the academic departments in schools. Junior secondary subjects should not be grouped with senior secondary subjects in one department. School principals should reconsider how teachers are allocated to NS and the suitability of HODs to lead the NS department. In addition, the department and senior school leadership teams should consider the appointment of senior teachers to provide instructional leadership in individual science disciplines that would complement the work of HOD and support the teachers with subject specific leadership.

Secondly, from a policy perspective, we recommend that the role of subject advisors be revised to include working with the HODs to build their capacity for more effective instructional support in schools. The HODs as middle managers have the most contact with teachers, and their potential to make a significant contribution to curriculum improvement remains untapped. This would also boost the capacity of school based support teams and turn the IQMS into an authentic school development tool.

Thirdly, we recommend that from a training perspective, much more attention be given to the role of the HOD as a key member of the SMT and the school's instructional leadership team. Currently, there is a focus on the training of principals and deputy principals that have not yet been extended to the HODs. The focus of such training should be on developing curriculum management and supervision skills; the monitoring of curriculum coverage; the assessment of learner work in order to improve instruction; and the soft skills of building personal and professional competencies around teamwork and dealing with conflict at the school. The curriculum for such a leadership training programme should take school contexts in account and focus on the importance of shifting the school leadership paradigm from bureaucratic management for compliance and control to instructional leadership for improved learning outcomes in the school.

Lastly, we recommend that as a supplement to this study, further research into the work of senior teachers should be conducted to develop a deeper understanding of the important role that they can play in supporting the work of the HOD in the sciences departments.

We worked with a small but representative sample of schools and the findings could not be generalised to all schools across the country. The findings are thus limited to the schools and districts that we worked in. However, the study is important as it is located within the broader research focus on instructional leadership in schools – a focus that has become central to the school improvement discourse and practice in South Africa.

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