

Subject Advisors' Understanding of their Curriculum Leadership Roles for Mathematics Improvement in South African Schools



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ABSTRACT

The study aimed to investigate the curriculum leadership role of Mathematics subject advisors in enhancing Mathematics education in South Africa. Using a case study design, seven Mathematics subject advisors and ten Mathematics educators were sampled from all seven districts of the Free State province. Data collection methods included in-depth semi-structured interviews, observations, and document analysis. Data analysis followed Tesch's (1990) eight-step coding technique. The field study revealed that Mathematics subject advisors' leadership roles encompassed providing support and guidance to educators, conducting educator appraisals, monitoring and overseeing educators' and learners' workbooks, mentoring, and professional development. They also handled administrative tasks findings like resource provision and paperwork using monitoring tools. While all subject advisors aimed to improve Mathematics achievement, their approaches varied. Some reviewed past strategies while others adapted based on resource availability. Individual educational philosophies also influenced their strategies. Moreover, subject advisors operate within a network that includes principals, educators, learners, and the broader context. Effective curriculum leadership depends on these interactions. Interestingly, none of the subject advisors claimed comprehensive knowledge of their subject area. Some lacked specialization in Mathematics or related fields in which they were operating. Many expressed a need for training, particularly in managing and supporting progressed learners. These findings suggest the need for a standardized model to guide leadership training for Mathematics subject advisors. Such a model could enhance curriculum leadership, thereby improving teaching practices and student performance. Future research could use these insights to develop this model.

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INTRODUCTION

Mathematics holds significant importance in societies worldwide, often becoming a central topic of discussion. Agyei and Voogt have noted that in Ghana, Mathematics has been made compulsory by the government, emphasizing its critical role in education and the ongoing efforts to enhance learner

achievement.¹ Despite its importance, global learner achievement in Mathematics remains suboptimal. Goh and Blake highlighted that the quality of educators significantly influences student performance in Mathematics.² The primary factors that contribute to poor learning outcomes can often be traced back to educators. This underscores the pivotal role of Mathematics subject advisors, whose leadership and support can directly impact educator quality and, consequently, student achievement. However, research indicates that many Mathematics subject advisors lack the necessary skills and competencies for their curriculum leadership roles. Often, they are not adequately prepared for the multifaceted responsibilities that come with the position.³ While some subject advisors learn on the job or rely on intuition to navigate their roles, others struggle due to the extensive and diverse nature of their responsibilities.⁴ This broad scope of work often limits their ability to effectively fulfill their leadership roles in the curriculum.

Both politicians and educators question whether subject advisors' curriculum leadership can effectively enhance classroom practices and improve learner achievement in mathematics.⁵ The concept of curriculum leadership has garnered significant attention in both international and national discussions, evolving into an internationally recognized reform strategy. It often features initiatives aimed at improving the quality, efficacy, and equity of mathematics education in secondary schools.⁶ Curriculum leadership has been implemented on all continents, including America, Europe, Asia, India, Pakistan, Kenya, Namibia, Nigeria, and Botswana.⁷ South Africa has also embraced this trend of educational reform.

However, despite its widespread adoption, there is a lack of consensus on the definition and scope of curriculum leadership. This diversity in conceptualization calls for cross-collaboration, especially in developing countries, to promote the adoption of curriculum leadership and improve mathematics performance in schools. Jita and Mokhele highlight the limited research on the effectiveness of subject advisors' curriculum leadership.⁸ There is a lack of understanding of how subject advisors perform their leadership roles, their focus areas, and their approaches to educator development. In developing countries, describing and capturing the impact of Mathematics subject advisors' curriculum leadership on learner achievement remains a challenge. Similarly, researchers in developed countries face difficulties in documenting successful cases of curriculum leadership that improve mathematics teaching and learning. To date, there is a noticeable gap in studies that focus on curriculum leadership and the role of subject advisors in improving mathematics education in the South African context.

The study thus seeks to examine how Mathematics subject advisors perceive their curriculum leadership roles in improving Mathematics education in South African schools. Specifically, the research focuses on Mathematics subject advisors in five selected districts within the Free State province.

LITERATURE REVIEW

Advocates argue that creating professional learning communities by grouping districts and schools can enhance educators' professional development, improve classroom practices, and better meet local needs, particularly in Mathematics education.⁹ Jita and Ndallane suggest that these communities provide a platform for educators, Heads of Departments, and subject advisors to collaborate and improve teaching.¹⁰ Goddard et al. also highlight that subject advisors can encourage schools to share resources and expertise,

¹ Douglas D. Agyei and Joke Voogt, "ICT Use in the Teaching of Mathematics: Implications for Professional Development of Pre-Service Teachers in Ghana," *Education and Information Technologies* 16, no. 4 (2011): 423–39, <https://doi.org/10.1007/s10639-010-9141-9>.

² Pauline Swee Choo Goh and Damian Blake, "Teacher Preparation in Malaysia: Needed Changes," *Teaching in Higher Education* 20, no. 5 (July 4, 2015): 469–80, <https://doi.org/10.1080/13562517.2015.1020780>.

³ Bryan S Turner, "The Body and Society: Explorations in Social Theory," 2008.

⁴ K. Roulston, *Reflective Interviewing: A Guide to Theory and Practice* (London: Sage, 2010); Sally J Zepeda and Bill Kruskamp, "High School Department Chairs—Perspectives on Instructional Supervision," *The High School Journal* 90, no. 4 (2007): 44–54.

⁵ Moeketsi Letseka, Bongani Bantwini, and Ethel King-McKenzie, "Public-Union Sector Politics and the Crisis of Education in South Africa," *Creative Education* 3, no. 07 (2012): 1197.

⁶ Karen Whitby, "School Inspection: Recent Experiences in High Performing Education Systems," *Reading: CfBT Education Trust*, 2010.

⁷ Loyiso C Jita and Matseliso L Mokhele, "Institutionalising Teacher Clusters in South Africa: Dilemmas and Contradictions," *Perspectives in Education* 30, no. 2 (2012): 1–11.

⁸ Jita and Mokhele, "Institutionalising Teacher Clusters in South Africa: Dilemmas and Contradictions."

⁹ Hertha Pomuti and Everard Weber, "Decentralization and School Management in Namibia: The Ideologies of Education Bureaucrats in Implementing Government Policies," *International Scholarly Research Notices* 2012, no. 1 (2012): 731072.

¹⁰ Loyiso C Jita and Tembi C Ndallane, "Teacher Clusters in South Africa: Opportunities and Constraints for Teacher Development and Change," *Perspectives in Education* 27, no. 1 (2009): 58–68.

leading to better classroom practices.¹¹ Maphosa et al. emphasize that subject advisors play a crucial role in fostering professional learning communities, allowing educators to experiment with new ideas and share best practices in teaching Mathematics.¹² Lock, et al. agree, noting that subject advisors help educators support each other's instructional methods.¹³ Additionally, subject advisors aim to address equity issues and improve educational quality, access, and student achievement. Heck and Hallinger refer to these efforts as curriculum leadership.¹⁴

However, the effectiveness of subject advisors' curriculum leadership has been questioned. Critics cite issues such as negative attitudes toward curriculum reforms, lack of guidelines, inadequate resources, and insufficient system support.¹⁵ Studies by Mangin and Blasé & Blasé also point out challenges that affect the success of curriculum leadership.¹⁶ Jita and Mokhele argue that institutionalizing educator leadership might hinder collaboration and learning.¹⁷ Wei et al. mention that long distances, lack of resources, and poor structures are additional challenges.¹⁸

Despite these issues, some researchers argue that the role of subject advisors remains valuable if these challenges are addressed.¹⁹ This controversy underscores the need for further research into the effectiveness of subject advisors in improving Mathematics education. Current research on the role of Mathematics subject advisors in South Africa is limited, and there is a need to explore their perceptions, expectations, and alignment with policy.²⁰ There is a dire need for subject advisors to encourage Mathematics teachers to collaborate with other teachers to foster the development of Science, Technology, Engineering and Mathematics (STEM) which were found lacking in Mafugu et al's study.²¹

South African learners consistently perform poorly on Mathematics assessments, including SACMEQ, TIMSS, ANA, and NSC exams.²² Further research is needed to determine if new educators and subject advisors receive adequate support.²³ Poopedi suggests ongoing studies to better understand the role of subject advisors and recommends exploring their impact on Mathematics improvement.²⁴ The need for further research is evident given the poor Mathematics results and the lack of comprehensive studies on Mathematics subject advisors in South Africa.²⁵

¹¹ Yvonne Goddard et al., "Connecting Principal Leadership, Teacher Collaboration, and Student Achievement," *Online Submission*, 2010.

¹² Mcebisi Maphosa, Herbert Talwana, and Phinehas Tukamuhabwa, "Assessment of Comparative Virulence and Resistance in Soybean Using Field Isolates of Soybean Rust," 2013.

¹³ Daniel Lock et al., "Examining the Longitudinal Structure, Stability, and Dimensional Interrelationships of Team Identification," *Journal of Sport Management* 28, no. 2 (2014): 119–35.

¹⁴ Ronald H Heck and Philip Hallinger, "Collaborative Leadership Effects on School Improvement: Integrating Unidirectional-and Reciprocal-Effects Models," *The Elementary School Journal* 111, no. 2 (2010): 226–52.

¹⁵ C. L. Weber, *Elements of Detection and Signal Design* (Springer Science & Business Media, 2012); L. P. Aipinge, "Cluster Centre Principals' Perceptions of the Implementation of the School Cluster System in Namibia" (Rhodes University, 2007).

¹⁶ Melinda M Mangin, "Facilitating Elementary Principals' Support for Instructional Teacher Leadership," *Educational Administration Quarterly* 43, no. 3 (2007): 319–57; Joseph Blase and Jo Blase, "The Dark Side of School Leadership: Implications for Administrator Preparation," *Leadership and Policy in Schools* 3, no. 4 (2004): 245–73.

¹⁷ Jita and Mokhele, "Institutionalising Teacher Clusters in South Africa: Dilemmas and Contradictions."

¹⁸ Ruth Chung Wei et al., "Professional Learning in the Learning Profession," *A Status Report on Teacher Development in the United States and Abroad*. Dallas, Tx: *National Staff Development Council*, 2009.

¹⁹ Aipinge, "Cluster Centre Principals' Perceptions of the Implementation of the School Cluster System in Namibia"; M. J. Uirab, "Clustering as Model for Effective Management [Sic] of Schools in Namibia" (North-West University, 2006).

²⁰ Raj Mestry, "Leadership Preparation and Development for Principals in South African Public Schools," *Preparation and Development of School Leaders in Africa* 73 (2019); Ursula Hoadley, Pam Christie, and Catherine L Ward, "Managing to Learn: Instructional Leadership in South African Secondary Schools," *School Leadership and Management* 29, no. 4 (2009): 373–89.

²¹ Tafirenyika Mafugu, "Science Pre-Service Teachers' Experience with Mentors during Teaching Practice," *Eurasia Journal of Mathematics, Science and Technology Education* 18, no. 11 (2022): em2170.

²² Ekaterina Anysia Lambrianos, *The Mathematics Curriculum Policy in South Africa and the Poor Performance of Learners in a Primary School in Gauteng* (University of Johannesburg (South Africa), 2019); M. Chetty, "Comparing School Based Assessments with Standardised National Assessments in South Africa" (University of the Witwatersrand, 2016).

²³ Shirley P Andrews, Linda S Gilbert, and Ellice P Martin, "The First Years of Teaching: Disparities in Perceptions of Support," *Action in Teacher Education* 28, no. 4 (2007): 4–13; Zepeda and Kruskamp, "High School Department Chairs—Perspectives on Instructional Supervision."

²⁴ Kwena Gedion Poopedi, "An Exploration of Successful Leadership in Challenging Circumstances-Case Studies of Two Kathorus Secondary Schools" (2011).

²⁵ Ramodikoe N Marishane, "The Right to Basic Education for All in South Africa: Implications for School Principals," *Koers* 82, no. 3 (2017): 1–8.

THEORETICAL FRAMEWORK

Various theories exist on language learning, as highlighted by Martin.²⁶ Gray and MacBlain define a theory as a set of principles or claims designed to explain specific facts or events.²⁷ This study used cognitive theory, the York-Barr and Duke educator leadership model, and the Angella and DeHart model to understand the role of subject advisors in curriculum leadership within South African secondary schools. Cognitive theory formed the foundational framework for our study. This research draws on literature related to Mathematics teaching and is guided by the cognitive framework presented by Spillane.²⁸ While previous studies have examined the role of subject advisors in sense-making during curriculum leadership implementation, they often overlooked the critical role of subject advisors in interpreting Mathematics policies. Understanding these policies is essential for effective curriculum leadership.²⁹ Implementation involves assigning meaning to policies and requiring subject advisors to determine their significance. This understanding helps them decide whether to adapt, ignore, or adopt policy recommendations in their practice. A crucial aspect of implementation focuses on how subject advisors translate their ideas in response to Mathematics curriculum policies, ultimately influencing educators' classroom practices. Using a cognitive framework enriches our understanding of the subject advisors' role in curriculum leadership.

METHODOLOGY

Research Design

This qualitative study employed a case study research design to delve deeply into the influence of secondary school Mathematics subject advisors' curriculum leadership on teaching and learning—a topic that has been relatively overlooked by researchers. The focus was on understanding the role of Mathematics subject advisors in secondary schools, particularly their comprehension and interpretation of Mathematics reform policies like CAPS. This investigation included their interactions with educators, learners, and the broader educational context. Therefore, the case study design was well-suited for this study, with the objective of investigating, exploring, and elucidating the curriculum leadership role of subject advisors in South African secondary schools in the context of Mathematics education.

Population and Sample

For the purposes of this study, the population comprised Mathematics subject advisors and educators teaching Mathematics in secondary schools within the Free State province. Purposive sampling was used to select seven mathematics subject advisors and ten educators. They were chosen based on their ability to provide comprehensive and detailed insights into how subject advisor curriculum leadership is practiced across districts, municipalities, and schools. Both subject advisors and educators were selected for their deep understanding of curriculum leadership. Given their roles, they are directly engaged in planning, implementing, monitoring, controlling, and evaluating curriculum leadership activities. Three educators from distinct districts were purposefully selected based on recommendations from the Chief Education Specialist due to their expertise in curriculum leadership. This was to ensure that diverse perspectives were taken into account when constructing the leadership role of subject advisor curriculum leadership within schools. The objective was to gather candid insights into how subject advisor curriculum leadership is executed, challenges faced, successes achieved, opportunities identified, and ways to enhance mathematics teaching and learning. A non-probability purposive sampling approach was employed, targeting participants who met the eligibility criteria.

Schools were nominated by district office heads and provincial Chief Education Specialists, who possess advanced knowledge of Mathematics Education. Participants were chosen based on their expertise in Mathematics subject advisor curriculum leadership roles. Seven subject advisors and ten educators from each district of the Free State were sampled for this study. Data collection was initiated with the researcher determining the sources and participants for data collection. The researcher served as the primary data

²⁶ Andrews, Gilbert, and Martin, "The First Years of Teaching: Disparities in Perceptions of Support."

²⁷ Colette Gray and Sean MacBlain, *Learning Theories in Childhood* (Sage, 2015).

²⁸ James P Spillane, "Cognition and Policy Implementation: District Policymakers and the Reform of Mathematics Education," *Cognition and Instruction* 18, no. 2 (2000): 141–79.

²⁹ Spillane, "Cognition and Policy Implementation: District Policymakers and the Reform of Mathematics Education."

collection agent. Participants were given the opportunity to share their experiences in curriculum leadership willingly and voluntarily.

The study involved visiting subject advisors and educators in the Free State province to explore their practices, roles, perceptions, ideas, concerns, and understanding of Mathematics subject advisor curriculum leadership. The interviews provided insights into the impacts of subject advisor curriculum leadership on educators' classroom practices and subsequently on learner achievement in mathematics. These interviews were complemented by observations and document analysis to triangulate the data. Concerns and experiences that were not clearly elucidated through document analysis were further explored through semi-structured qualitative interviews guided by an interview schedule (see Appendices E & F). This approach aimed to make Mathematics subject advisors and educators comfortable, guiding them through open-ended questions related to the study.

Appointments were scheduled at convenient times for each participant in an environment conducive to open conversation. Data were collected through interviews conducted in quiet and secure settings, such as subject advisors' offices and educators' classrooms or offices, with each session lasting between 50 to 60 minutes. Observations were also conducted by the researcher to validate interactions between subject advisors and educators during workshops and meetings. The overarching research question guiding these observations was: How do subject advisors across various contexts in South Africa perceive and execute their roles in curriculum leadership to support the enhancement of Mathematics instruction?

Trustworthiness

According to Schwandt, trustworthiness in research refers to "the quality or merit of an investigation that makes it notable to its audiences."³⁰ Speziale and Carpenter define it as ensuring the reliability and validity of qualitative research.³¹ In this study, trustworthiness was established by accurately reflecting the experiences, beliefs, perceptions, ideas, and concerns of Mathematics subject advisors and educators regarding the curriculum leadership role of Mathematics subject advisors. The trustworthiness of the data through method triangulation was demonstrated by the researchers' careful attention to and confirmation of the information, as emphasized by Corbin and Strauss.³² The confidence in the data, interpretation, and procedures used to ensure the quality of a study is termed its trustworthiness. Four main components contribute to the reliability of the data: credibility, transferability, dependability, and confirmability.

Credibility refers to the trustworthiness of the research findings. It is described as the confidence level in the truth of the research findings. Qualitative researchers often use triangulation to enhance credibility. Transferability relates to the extent to which the study's findings can be applied to different contexts. In this study, extensive descriptions were provided to demonstrate how the findings can be applied in various situations. Dependability is ensured by having participants assess the study's findings, thereby validating their reliability. Confirmability is achieved by maintaining objectivity throughout the research process.

Data Analysis

In this study, data analysis followed Tesch's eight-step coding technique outlined below:

1. Prepare the Data: Transform raw data into written text suitable for analysis, deciding whether to transcribe all details or just the main content based on research needs.
2. Define the Unit of Analysis: Determine the basic text unit for coding, typically focusing on themes rather than specific linguistic units.
3. Develop Categories and a Coding Scheme: Create a coding scheme based on data, previous studies, or theories, using either inductive or deductive methods. Develop a coding manual to ensure consistency.

³⁰ Thomas A Schwandt, "Dictionary of Qualitative Inquiry" (Sage Publication, Inc, 2001).

³¹ Helen Streubert Speziale, Helen J Streubert, and Dona Rinaldi Carpenter, *Qualitative Research in Nursing: Advancing the Humanistic Imperative* (Lippincott Williams & Wilkins, 2011).

³² J. Corbin and A Strauss, *Basics of Qualitative Research: Techniques and Procedures for Developing* (Thousand Oaks, CA: Sage Publications, 2008).

4. Test Your Coding Scheme: Validate the coding scheme with a sample of text, checking for consistency and revising as needed.
5. Code All the Text: Apply coding rules to the entire data set, monitoring for consistency and updating codes as new themes emerge.
6. Assess Your Coding Consistency: Recheck coding consistency to ensure accuracy throughout the analysis.
7. Draw Conclusions from the Coded Data: Analyze the themes and categories, exploring their properties and relationships to make inferences and present findings.
8. Report Your Methods and Findings: Document and report the analysis process and results comprehensively, balancing description and interpretation to support replicability and clarity.

To maintain confidentiality and clarity in handling the large volume of data from Mathematics educators at ten secondary schools and Mathematics subject advisors, pseudonyms were used to identify them. This approach ensured the authenticity of the exploration into the findings on Mathematics subject advisors' curriculum leadership.

PRESENTATION OF FINDINGS AND DISCUSSION

This section presents and analyses data collected by means of semi-structured interviews and structured observation. The codes and categories listed in Table 1 below were used to present the findings and indicate the contexts in which the data were collected.

Table 1: School codes and their categories

School Code	Category
School A	PRS
School B	PRS
School C	PS
School D	PRS
School E	PS
School F	PS
School G	PS
School H	PS
School I	PRS
School Code	Category
School J	PS

Table 2: District codes, subject advisors' pseudonyms and race

Table 2 below shows the district code, the pseudonyms of subject advisors and the race of the subject advisors who participated in this study.

Subject Advisor	District Code	Subject Advisors' Pseudonyms	Race
1	District A	Marry	White
2	District B	Charles	Coloured
3	District B	Veronica	Coloured
4	District C	Paul	Black
5	District C	Thokozani	Black

6	District D	Natasha	Indian
7	District E	Andrew	White

Table 2 indicates the sequence in which the subject advisors were interviewed, as well as the races of the subject advisors. In District A only one subject advisor (Marry) participated, in District B, two subject advisors (Charles and Veronica) participated, in District C, two subject advisors (Paul and Thokozani) participated, one subject advisor participated in District D (Natasha) and one subject advisor (Andrew) participated in District E. Table 3 shows the school codes, educators' pseudonyms and the race of educators who participated in this study.

Table 3: School codes, educators' pseudonyms and race

School Code	Educators' Pseudonyms	Race
School A	Themba	Black
School B	Mavis	White
School Code	Educators' Pseudonyms	Race
School C	Jerome	Coloured
School D	Albert	Indian
School E	Jessica	White
School F	Fionah	Coloured
School G	Siyabonga	Black
School H	Helen	Coloured
School I	Khulekani	Black
School J	James	Chinese

In addition to using pseudonyms to protect participants' identities, it was also important to avoid addressing subject advisors and educators by titles that would hint at and/or possibly reveal their gender (Dr/Mr/Mrs/Miss) – this measure was intended to protect the participants and the researcher's identity. The job title was used instead, for example, 'subject advisor or educator Marry' or the subject advisor or educator is simply addressed directly by their pseudonym (Marry). This also ensured that data could not be matched with any subject advisor or educator who participated in this study. Before the participants signed the consent forms, the researchers intended to maintain the confidentiality of the participants. Efforts were made to keep this promise as far as possible. Participants consisted of male and female subject advisors and educators.

Demographic Data of Subject Advisors and Educators

Table 4 provides demographic details of the subject advisors. Data relating to their gender, experience in teaching, experience in the subject advisor post and reasons for their appointment, subject specialisation and qualifications are provided. Table 4 will be the reference point when presenting data on the criteria used for the appointment of subject advisors. Table 4 shows the subject pseudonyms of the advisors, gender, teaching experience, experience in the subject advisors' post, and reason for appointment, subject specialisation, qualifications and age.

Table 4: Demographic data for subject advisors

Subject Advisors' Pseudonyms	Gender	Experiences Subject Advisors' Post (years)	Reason for Appointment	Subject Specialization	Qualifications	Age Range
Marry	F	9	Experience, qualification	Mathematics, Chemistry	B.Sc. B.Ed. Honours	41 - 50
Charles	M	6	Good results, qualification, experience	Mathematics, physics	B.Sc. ACE	41 - 50
Veronica	F	10	Qualification, Good results	Accounting, Economics	B.Ed.	31 - 40
Paul	M	14	Qualification, experience	Mathematics, Statistics	B.Sc.	41 - 50
Thokozani	M	15	Experience Good results Qualification	Mathematics, Chemistry	B.Ed.	50>
Natasha	F	9	Qualification, experience Good results	Mathematics, Accounting	B.Acc. PGCE	31 - 40
Andrew	M	18	Quality results	Physics, Chemistry	B.Sc. ACE	41-50

One of the issues in which the researcher was interested was the gender representation of the Mathematics subject advisors and educators. This was important because Mathematics departments in schools and subject advisors in district offices consist of male and female staff. Hence, it was interesting to learn about the leadership composition of the departments in schools and subject advisors in district offices in terms of gender. Data from the seven subject advisors reveal that three of the subject advisors were female while the other four were male. It also emerged that out of the ten secondary schools under investigation, four educators were females and six were males. Gender distribution was considered balanced in this study. The subject advisors' gender composition in the schools visited challenges the argument by Leithwood and Jantzi that although women have made great strides in achieving higher positions within organisations, they are still underrepresented at higher levels of organisations.³³ Even though biographical data were not included to answer any research questions, these data were crucial for the exploration of subject advisors' curriculum leadership because they enabled the current study to illustrate gender-balance in Mathematics subject advisors' curriculum leadership.

Theme 1: Knowledge of the Curriculum, Skills and Learning Programmes

Category 1: Curriculum knowledge, skills and learning programmes

Skills, knowledge and personal characteristics of the subject advisors relate to their age, level of education, time spent in the post, qualifications and past experiences of teaching Mathematics. This is captured in Mavis' words: *Hard work pays, even though there were senior and more experienced educators who were invited for the interviews, I outclassed them because I was shouting results as opposed to plans.* The above words suggest that the time spent in the post is not the only factor to be

³³ Kenneth Leithwood and Doris Jantzi, "Linking Leadership to Student Learning: The Contributions of Leader Efficacy," *Educational Administration Quarterly* 44, no. 4 (2008): 496–528.

considered when appointing subject advisors. Other factors such as the history of educators' results in a subject and content knowledge also play a role.

Andrew also shared the same opinion when he stated that: *I conduct educator content training workshops covering content challenges, classroom management, learner discipline as well as strategies for assisting progressed learners. Mr Sithole, I am a good curriculum leader because my district is the best according to November 2018 Grade 12 Mathematics results.* In addition, they relate to the knowledge, skills, attitudes and commitment of subject advisors toward curriculum leadership.³⁴ This is best illustrated by Paul who claimed that: *Educator professional development is priority number one in my curriculum leadership. At times, I train educators and attend content workshops even though I am sick. Mr Sithole, you remember that in June I requested you to train educators on my behalf because I was not feeling well. In fact, I was booked off by my medical doctor during that week, but I had to attend the workshop.*

This study focused mainly on the professional knowledge of subject advisors since the researcher is of the view that it is professional knowledge that is used by subject advisors as leaders of the curriculum. This is evidenced by Natasha who stated that: *I always encourage and advise my educators to teach for conceptual understanding.* It was important to relate subject advisors' views in connection to subject advisors' role as curriculum leaders in facilitating and promoting effective teaching and learning of Mathematics to a suitable theoretical framework and hence cognitive theory was applied. In doing so, cognitive theory sheds light on the attitudes, ideas, perceptions and understanding of subject advisors' reform policies hoping to get a deeper understanding of the influence of subject advisors' curriculum leadership on educators' teaching practices and the impact it has on learner achievement.

It was evident from the collected data that subject advisors viewed curriculum delivery as their foremost priority. Types of curriculum knowledge identified by the participants include conceptual understanding of Mathematics, and attitude towards Mathematics, content knowledge and classroom practices. Participants reported having high expectations of both educators and learners; Both groups had to exhibit a commitment to learner achievement and effective teaching and learning and they had to ensure that the curriculum promoted learners' achievement effectively and that educators had a sense of understanding and knowledge of Mathematics Maphosa et al. states that subject advisors and educators must possess knowledge of their subject areas to possess good leadership and management. Subject advisors encouraged educators to plan lessons together and this activity addressed learner's needs.³⁵ Marry explained her role: *I support schools by organising question papers from other provinces; sharing them with educators, networking with educators through WhatsApp, emails and telephones, organizing content workshops for educators, team teaching and promoting educators to join other professional bodies such as the Association of Mathematics Educators in South Africa (AMESA).* The subject advisors interviewed had a strong content knowledge of Mathematics and most had majored in the subject. Evidence suggested that the subject advisors encouraged educators to engage learners in high-level thinking skills by encouraging them to actively participate in class discussions. During the observations, it was observed that learners were provided with support until they could perform the tasks on their own. Andrew stated: *I help my educators to develop skills that assist them in delivering the curriculum in the most effective and efficient ways utilising the available resources. Moreover, I support and assist educators in curriculum interpretation as well as lesson preparation, lesson presentation and learner assessment.*

Some educators did not feel comfortable working with the deeper and higher cognitive levels of assessment benchmarks, because they lacked content knowledge. This resulted in their failure to cover the curriculum, and consequently, educators in the next grades had to spend a great deal of time teaching concepts that learners should have mastered in previous grades. Although subject advisors should assist educators in creating new knowledge and skills that ensure that their schools are at the maximum operating level, as maintained by Sallis and Jones, there were challenges encountered by participants in

³⁴ Chris Turner and Ray Bolam, "Analysing the Role of the Subject Head of Department in Secondary Schools in England and Wales: Towards a Theoretical Framework," *School Leadership & Management* 18, no. 3 (1998): 373–88.

³⁵ Maphosa, Talwana, and Tukamuhabwa, "Assessment of Comparative Virulence and Resistance in Soybean Using Field Isolates of Soybean Rust."

attempting to keep up with all the changes and increasing demands of curriculum leadership.³⁶ Veronica admitted: *Even though I did not have teaching experience in Grade 12 Mathematics, my appointment as a subject advisor was influenced by my good results in my Mathematics department.* Even though the participant at School E had not majored in the subject, she was appointed to serve as HoD. The same applied to the participant at School G, who confirmed that: *Although I am the appointed HoD for Mathematics, geography and business studies were my major subjects. When I came to this school, there was a need for a Mathematics HoD and I volunteered, I never taught Mathematics in my life. However, I have very close contact with other colleagues in the district who assist me. The outstanding support received from the subject advisor is the reason why our results at the end of the year are very good. For the past four years, we have been achieving above 80% pass rate.*

The lack of support from the district also made it difficult for subject advisors to perform their curriculum leadership; Marry stated: *I need training on how to assist educators to be patient with progressed learners. I also need support on the best ways of assisting progressed learners to achieve more in Mathematics.* The participant at School D also pointed out that the training comprised discussing Mathematics content knowledge, assessment, and classroom management as well as teaching strategies. However, after educators receive training; there are no follow-ups on educators' work. This is best illustrated by Themba, who stated: *Learner achievement results in Mathematics remains low (59%) in my school despite having attended several educator professional development workshops. Mr Sithole, this year alone I attended five workshops. My wish is for these trainings and workshops to be conducted at schools so that the subject advisors can demonstrate better methodologies that accommodate progressed learners.*

Subject advisors reported that they maintained ongoing conversations with educators about how curriculum and teaching methods need to be communicated and connected with educators' everyday teaching practices. Participants' response also showed their continuous engagement in making decisions related to teaching and learning Mathematics. Participants at School F reported that school management team (SMT) meetings were held every weekday morning, and that team members discussed new developments in teaching, curriculum coverage, learner achievement, learner discipline and absenteeism. In contrast, the participant at School A challenged this view by stating: *As an educator, I am not involved in the drafting of the school's performance management policies. I know the potential of my learners in this school; however, I have little say in setting learner achievement targets. The subject advisor is running the show alone. All that he does is dictate to me unrealistic targets. Mr Sithole, I am really stressed because my learners will never give me a 95% pass rate and an average of 50%.*

This sentiment was shared by School J's participant, who, in expressing his dissatisfaction, said: *If I can be involved in the setting of school targets, I would be more satisfied and would be motivated to perform better because there will be collective ownership of school targets.*

Participants reported an increase in the enrolment of learners taking Mathematics from Grades 10 to 12, a consequence of the Member of the Executive Council's (MEC) Mathematics for All campaign. In addition, participants reported that condoned (progressed) learners, that is, learners who have failed Grades 8,9,10, or 11 but are promoted to the next grade due to age, posed a challenge to their curriculum leadership, thereby hindering effective teaching and learning of Mathematics, resulting in poor learner achievement. Marry blamed this poor learner achievement on ineffective educators who, protected by their unions, refused to attend weekend and holiday classes without additional remuneration. She stated: *I believe that progressed learners are as a result of educators who are impatient with learners and that every learner can achieve but the levels of achievement differ from one learner to another. I am of the opinion that Mathematics for All can be realised if educators can do their core business of teaching with love and patience.* Natasha had a different view, she stated: *What do you expect if unions do not encourage educators to go the extra mile even without additional remuneration? Progressed learners will remain in the system as long as educators are supported by their unions. Right now, the slogan of SADTU in my district is: to all our union members, no additional pay, no extra classes.* Subject advisors must use their knowledge of the curriculum and learning programmes to the advantage of learners. They should try to work with unions, district department officials, and policymakers to

³⁶ Gary Jones and Edward Sallis, *Knowledge Management in Education* (Routledge, 2013), <https://doi.org/10.4324/9780203724910>.

improve the quality of teaching and learning of Mathematics. Unions and department officials should try to come together and agree on ways of meeting the demands of educators without compromising learners' basic right to access quality teaching and learning.

Category 2: Knowledge of educators

Generally, subject advisors want to use educators in the most efficient and effective ways within the boundaries of the school timetable and during extra classes (weekends, holidays, for example). The subject advisors depend on their knowledge of educators' strengths, personalities, and attitudes toward schoolwork, weaknesses, and commitment. Subject advisors acquire this information in different settings such as departmental meetings, formal classroom lesson observations, and informal meetings during break, lunch or after school hours, educators' attendance, and willingness of educators to conduct extra classes during weekends and holidays and learner achievement results.

In addition to this, subject advisors even consult other educators to enrich their knowledge of individual educators in the district. As stated by Thokozani: *I do not know everything and hence I continuously attend developmental workshops and trainings in order for me to be capacitated so that I can also empower educators and learners. I am a lifelong subject advisor who has successfully imparted this life-learning spirit to my educators. I have created a platform where educators in my district are free to approach me and disclose the challenges that they encounter while teaching and learning Mathematics. A few of my educators are still having content challenges and others have challenges of memo interpretation.*

Andrew had a similar view when he stated: *I know my educators in this district very well. Based on educator needs, I conduct educator content training workshops covering content challenges, classroom management, learner discipline as well as strategies for assisting progressed learners to achieve more in Mathematics.*

This knowledge of individual educators may be directly or indirectly referred to by subject advisors when working in a variety of settings. The settings may include classroom observations, the subject advisor as a role model, such as educators observing the subject advisor teaching, the subject advisor doing educator appraisal, subject advisor coaching, and mentoring educators, discussions of work schedule, curriculum coverage, content workshops, as well as working with conflict and managing it. As claimed by Sailors and Shanklin, knowledge about people can be disorganised, random, and in most cases, implicit because it is subconsciously absorbed daily.³⁷ As advocated by Turner and Bolam, as well as Nkambule and Amsterdam, this knowledge can be improved by seeing educators in different settings such as in the classrooms, socially inside as well as outside school premises, and in formal meetings.³⁸ Consequently, Mathematics subject advisors may become more aware of educators' training and development needs in the hope of improving educators' professional understanding of effective teaching and learning, and educator-subject advisor contacts and feedback sessions may provide useful information concerning an educators' morale or educators' perceived lack of career progression.

Category 3: Contextual Knowledge

Contextual knowledge of curriculum leadership was considered an important key in understanding subject advisors' curriculum leadership. Contextual knowledge is best used in district meetings, for instance, strengths and weaknesses of educators and classroom settings, such as the shortcomings and challenges due to the limited resource availability. This is best illustrated by a participant from school D, who complained: *'Mathematics for All' will never be realised in this school because of the shortage of resources. Mr Sithole, can you believe that I am the only Mathematics educator in this school? I am teaching Grade 8 to 12 Mathematics. I would really appreciate it if the principal could hire another mathematics educator. I also have textbook challenges in Grades 9 and 10. I am really burning out because every grade needs an extra class.*

³⁷ Misty Sailors and Nancy L Shanklin, "Introduction: Growing Evidence to Support Coaching in Literacy and Mathematics," *The Elementary School Journal* 111, no. 1 (2010): 1–6.

³⁸ Turner and Bolam, "Analysing the Role of the Subject Head of Department in Secondary Schools in England and Wales: Towards a Theoretical Framework." Gugulethu Nkambule and Christina Amsterdam, "The Realities of Educator Support in a South African School District," *South African Journal of Education* 38, no. 1 (2018).

In addition, knowledge of the school culture, priorities, and school values is included in the contextual knowledge of the subject advisors. This is best illustrated by the response of Paul who reported on the best strategies for leading Mathematics in the district: *I ensure that both educators and learners stay motivated. I organise district trips for learners to go for excursions where they see the application of Mathematics in real-life situations. I encourage and advise my educators to integrate theory with practice – that is when introducing a chapter, educators must tell learners where they can apply and use that chapter (knowledge) in real-life situations. Besides this, I also encourage schools to camp learners in all my schools. Currently, twenty-nine schools out of 37 schools are camping learners; learners come to school and sleep at school from Monday until Saturday. On Sunday, learners are given time to go to church, see their parents and come back to school at 17:00hrs. Learners are taught and they do question papers during camps.*

Much, but not all, of contextual knowledge is consciously held even though it is rarely written down and will usually contain strong personal elements.³⁹ Subject advisors refer to contextual knowledge when discussing views and ideas on working with learners, educators, or parents. In addition, contextual knowledge was used when discussing the requirements for special facilities, deployment and redeployment of educators, timetable restrictions, as well as resource availability and allocation thereof. Other departmental policies toward discipline, assessment, homework and management of progressed learners were seen as pivotal components of subject advisors' contextual knowledge informing subject advisors' curriculum leadership practices.

Category 4: Conceptual knowledge and educational practice

Subject advisors, as subject experts, were found to have the necessary skills, strategies, methodologies and well-developed updated curriculum developments, and knew the importance of educator professional development. Educational practice knowledge is important when making decisions with, for instance, curriculum changes. At the heart of all these varied aspects are the personal beliefs and values of the subject advisors, which ultimately influence subject advisors' attitudes towards educators and perceptions of educators' classroom practices. According to Nkambule and Amsterdam, conceptual knowledge is a set of theories stored in the memory and used to analyse issues, problems and policies.⁴⁰ There can be problems, however, in the transfer of ideas from one setting to another. This occurs when subject advisors attend district and provincial workshops and are made aware of better techniques of leading and managing districts, as well as better teaching and learning techniques, but they fail to incorporate and integrate the information in schools. As pointed out by Andrew: *As for the challenges, time is a problem, most of these workshops are done after school hours and during weekends and educators have commitments after school. Some educators are very loyal to their unions, that is, SADTU (South African Democratic Teachers Union). They don't work after normal working hours without additional remuneration. We are, therefore, forced to have workshops during the week and this disrupts effective teaching and learning in schools.*

In contrast, the participant at School D had good working relations with departmental staff members. The participant has created time for IQMS and educator appraisal during his free periods and after school hours. This is best explained by the participant's response: *I squeeze leadership activities that are educator appraisal during my free periods and sometimes after school hours. During my free periods, I also move around checking on learners who are outside and take them back into their classrooms.* Siyabonga claimed that *some workshops are time wasting: I have been attending workshops for more than ten years now. My experience of these workshops has taught me that attending district workshops is inversely proportional to learner achievement results in Mathematics. The more I attend, the more learners fail, and vice versa.* This inevitably leads to conceptual knowledge being applied ineffectively. Learning about leadership change and management, for example, does not guarantee that subject advisors will be able to manage and lead well in the context within which educators operate, as

³⁹ Turner and Bolam, "Analysing the Role of the Subject Head of Department in Secondary Schools in England and Wales: Towards a Theoretical Framework."

⁴⁰ Nkambule and Amsterdam, "The Realities of Educator Support in a South African School District."

claimed by Turner and Bolam.⁴¹

Category 5: Knowledge of the processes

At the heart of process knowledge is the understanding of knowing what has to be done and planning to do it. This is best illustrated by the response of Charles, who stated: *I encourage my educators to teach learners basics first. Teamwork is the glue that binds educators in my district, for example, team teaching is the backbone of our success in the district. In my district, educators plan together, teach together and do their own reflections in their respective circuits (municipalities).* Natasha also shared the same view and reported: *I develop my educators by being informed by their needs identified from IQMS as well as offering support in areas where educators have content challenges and even social problems. I referred three educators to the employee wellness section in my district last year. Two of the educators are responding very well as evidenced by their improved attitude towards their schoolwork; the other educator still needs more time for him to change. Remember Mr Sithole, that I was a teacher before becoming a subject advisor; I demonstrate to educators how to teach challenging content areas.*

Knowing processes such as team building, organising, planning, controlling and leading the curriculum are important for effective subject advisors' curriculum leadership. Process knowledge includes a wide range of skills such as allocating educators effectively within the constraints of the available human resources, and dealing with school challenges.

Category 6: Control of Knowledge

Control of knowledge is based on the individual subject advisors and it includes knowledge of one's own knowledge, skills, the place and manner to use them and when to look beyond one's own available resources. The most important aspect of control of knowledge is being aware of one's own particular strengths and weaknesses. This is illustrated by the response from a participant at School J: *Although I am the HoD of Mathematics, Geography and Business Studies were my major subjects. When I came to this school, there was a need for a Mathematics HoD and I volunteered. I never taught Mathematics in my life. However, I have very close contact with other colleagues in the district who assist me. The outstanding support from the subject advisor is the reason why our results for the year are very good. For the past six years, we have been achieving above 85% pass rate.*

Thus, subject advisors need control of knowledge when thinking about the best ways of proposing efficient and effective use of educators and other resources in the teaching and learning of Mathematics. A case in point is when the HoD did not major and specialise in Mathematics while other educators in the department specialised in Mathematics. Therefore, the subject advisor must encourage the HoD as a curriculum leader to delegate duties and responsibilities to more experienced, expert educators as well as those who specialise in Mathematics.

Category 7: Skills

Subject advisors as leaders of the curriculum demonstrate the following skills, leadership, decision-making, communication and management. These skills are based on the competency levels of the subject advisors and if subject advisors are to make a difference within their districts; for example, by improving the quality of teaching and learning, which in turn influences learner achievement, then an over-reliance on subject advisors' competency alone may not be adequate. This is illustrated in the response of Marry, who reported that: *In order to make my schools perform and improve learner achievement results in Mathematics, I maintain close relationships between the internal and external environments to meet both educator and learner needs. I set targets and standards for both educators' and learners' achievement and then work as a team to ensure that the targets are met. In my district, effective teaching and learning is priority number one and I encourage my educators to involve learners actively during teaching and learning.*

Some of the subject advisors in this study noted the lack of time to reflect on how they lead and manage their districts, as they would like due to heavy workloads. This is best illustrated by Marry who

⁴¹ Turner and Bolam, "Analysing the Role of the Subject Head of Department in Secondary Schools in England and Wales: Towards a Theoretical Framework."

stated that: *I have 49 secondary schools that I am working with. All these secondary schools are offering Mathematics from Grades 8 to 12. Even though I am only controlling and moderating the FET (Further Education and Training) band, Grades 10 to 12, the workload is seemingly becoming unmanageable and this is coupled with shortages of transport in my district. I would really appreciate it if the Department could provide transport so that I can control, moderate, and advise according to my year plan.* These skills are almost entirely based on learning from experience, with only occasional references to theoretical learning.

Discussion Summary

In the first place, the curriculum leadership role of mathematics subject advisors in South Africa takes varied forms and differs in the nature of subject advisors' activities as well as how they are executed. The curriculum leadership role of subject advisors in this study was characterised by analysis of learner achievement results, administration, supervising and observing lessons, monitoring and controlling both educator and learner workbooks, conducting educator professional development workshops, networking with parents, goal setting, among other activities which many scholars have classified as key elements of curriculum leadership.⁴²

From the findings, it was evident that most educators were clear about the district's goals to improve the teaching and learning of Mathematics. Educators seemed to be aware of the district mission and admitted that they were actively involved in the formulation of the mission and district action plans even though the district mission document was not available in all the different ten secondary schools studied. However, from the analysed interview, observation and document data, it became evident that very few of the subject advisors seemed to be doing well in the curriculum leadership role of providing instructional artefacts and creating a positive climate. Subject advisors and educators felt that the rewards or incentives to motivate them to teach and learn effectively were not adequate, particularly in the context of the rather declining economy in South Africa.

RECOMMENDATIONS

The study recommends that, more work is needed, however, as a way of ensuring that educator professional development activities of subject advisors address the core activities of teaching and learning in schools by engaging educators in more interactive professional development workshops focusing on pedagogical content knowledge. From the analysed data, it was not clear whether any of the subject advisors had managed to shape their curriculum leadership practices to connect more tightly with the teaching and learning of mathematics.

Furthermore, it is recommended that subject advisors specify aspects of concepts and the way they understand issues such as features of better and improved teaching and learning practices to maintain, improve and sustain quality teaching and learning as revealed in learner achievement results in Mathematics. The researcher strongly feels there was a need for the subject advisors to arrange meetings with educators, learners and learners' parents to address issues with learner achievement and motivation. It seems that there has been no follow-up after identifying challenges with the achievement of certain learners.

It is also recommended that the workload of subject advisors be reduced, with the Department of Education encouraging schools to integrate educator mentoring in everyday teaching activities. This will prevent the problem of filling in educator professional development forms when they are needed by the district offices, without necessarily having done the real processes of mentoring that are classroom observations. Subject advisors need to develop educator mentoring systems and strategies for assisting and supporting educators in their districts. Educator appraisal has to concentrate on issues that lead to an improvement of educators' classroom practices, skills and strategies with the hope of improving learner achievement results in mathematics.

⁴² Heck and Hallinger, "Collaborative Leadership Effects on School Improvement: Integrating Unidirectional-and Reciprocal-Effects Models"; James P Spillane and Enrique C Orlina, "Investigating Leadership Practice: Exploring the Entailments of Taking a Distributed Perspective," *Leadership and Policy in Schools* 4, no. 3 (2005): 157–76.

CONCLUSION

The exploration of the policy and regulatory framework guiding the functions of subject advisors in South Africa reveals a complex and multifaceted landscape. The findings highlight that subject advisors operate within a framework shaped by various policies, including curriculum reforms, national and provincial test programmes, progression and modularisation policies, and the Employment of Educators Act (EEA) and Personnel Administrative Measures (PAM). The insights gathered indicate that subject advisors generally understand and are familiar with these frameworks, yet practical challenges persist. For instance, while the Mathematics for All campaign aims to democratize mathematical education, opinions vary on its feasibility, reflecting broader debates about educational equity and learner capabilities. Similarly, while national and provincial test programmes are acknowledged for setting educational benchmarks, they also contribute to pressures that can hinder effective teaching and learning, particularly for progressed learners. Furthermore, policies related to progression and modularisation present both opportunities and challenges. While intervention strategies and additional support are in place for progressed learners, there are concerns about the efficacy of these measures and the extent to which they align with individual learner needs and potential. The Employment of Educators Act and Personnel Administrative Measures provide essential guidelines for subject advisors, but gaps in access to these documents suggest a need for improved dissemination and support. Overall, while there is recognition of the frameworks' influence, the implementation and accessibility of these policies remain areas for development. The current approach includes targeted interventions such as extra classes for progressed learners, aiming to bridge gaps and enhance educational outcomes. However, addressing the inconsistencies and challenges identified will be crucial for strengthening curriculum leadership and support in South Africa.

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