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Mentoring novice natural science teachers: a case study in the Gauteng province

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The study reported on here was undertaken to understand the impact of mentoring novice science teachers. The study was conducted within the Gauteng province, because there have been many debates and concerns on the necessity to devise ways of improving the understanding of science in schools in the province. The purpose of this study was to understand the effects and impact of mentoring novice natural science teachers within the Gauteng province. We used the qualitative research approach and this was motivated by the need to understand the perceptions and experiences of the research participants. Purposive sampling was used as sampling method to select novice science teachers and relevant teachers to be part of the sample. Through the use of semi-structured interviews as data collection method, it was discovered that mentoring of novice teachers refers to the method of empowering new teachers to be effective in their work-related tasks to become true professionals in the academic profession. We concluded that several mentoring initiatives and mechanisms were used to assist novice teachers. Among these programmes, training, skills development and technical support to enhance communication skills and manage the curriculum were underscored. We concluded that the mentoring of novice teachers was important within Gauteng, as it raised awareness and lead to expert science teachers being equipped with a wide range of skills to achieve the best results in the classroom. Mentoring also capacitates novice teachers on how to handle laboratory equipment and chemicals to benefit learners. We also gathered that mentoring had a direct impact on novice science teachers. It lead to the creation of an effective and excellent teaching environment, resulted in higher levels of teacher retention and improved teachers' service delivery. It also strengthened the emotional and psychological well-being of teachers. We thus recommend training, development, and the allocation of finances towards enhancing the mentoring of novice science teachers.

Keywords: facilitation; Gauteng province; induction; laboratory; learners, mentee; mentor; mentoring; novice natural science teachers; senior education specialist; supportive programmes; training and development

Introduction

The prevailing situation of novice teachers' attrition, especially within the South African educational system, has had far-reaching implications. With this research we sought to understand this discourse and attempt to proffer solutions.

Crickmer (2007) and Robinson (2015), among other researchers in South Africa, have noted that beginner teachers tend to face numerous problems in the initial years of their careers as a result of a lack of mentoring facilities. This is a global problem, which has been found to lead to the phenomenon of novice teacher attrition. The attrition rate of novice teachers in South Africa is at 55% while in the United States it is at 50% (Paulse, 2005). Novice teacher attrition is a global problem as it impacts negatively on countries' educational development strategies.

In countries like the United States of America, Britain, Singapore, Japan and Australia the need to implement formal novice teacher support programmes has been realised (Phelps, 2003) as such programmes contribute immensely to educational development within society. Education is of vital importance worldwide. The South African Schools Act 84 of 1996 (Republic of South Africa, 1996) prescribes that instruction and learning are required for every South African from the age of 7 to 15 years. In this respect, the South African National Qualifications Framework (NQF) recognises three levels of teaching and learning, namely General Education and Training, Further Education and Training and Higher Education and Training (Ramsarup, 2017). In 2016, former President Zuma, in understanding that education is a tool for empowerment, established the education trust for easy access to education for disadvantaged children (*SA News*, 2016). Policies and methods have been implemented to ensure the progressive realisation of this right to education. The Integrated Strategic Planning Framework for Teacher Education and Development for the period 2011–2025 serves as a blueprint for teacher development. With this study we sought to investigate the absence of induction or beginner teacher support programmes and mentoring in existing teacher development programmes, which are either informal or not available to all South African teachers (Robinson, 2015). In this study the focus was on exploring the mentoring programmes in place for novice natural science teachers and how confident novice teachers were in the field. Most industries allow newly recruited employees to receive orientation and induction from senior staff. However, schools in South Africa, especially in the Gauteng province, do not provide induction programmes to newly appointed teachers. Newly appointed teachers are left to fend for themselves without any meaningful socialisation and acculturation. Dale-Jones (2014:7) confirms the foregoing dilemma of novice teachers in South Africa by postulating that "not many schools have formalised mentoring programmes and the trend is more towards an unplanned version of this." Bridge (2016) further concedes that the government's Integrated Strategic Planning Framework for Teacher Education and Development in South Africa 2011–2025 foregrounds

mentoring in all stages of teacher education, but full-scale implementation is not yet in place. Mentoring of novice teachers is important as it guarantees the development of teachers to become relevant in their discourse. Furthermore, mentoring of novice teachers builds confidence, enhances their ability to be productive, reduces novice teacher attrition, and increases novice teacher retention – all leading to stimulate learner performance. Studies conducted within this context have shown that the academic performance of students is poor if the teacher is inexperienced.

Research Questions

The research questions in this study were the following:

- What are the effects and impact of mentoring novice natural science teachers in the Gauteng province?

Apart from the main research question, we sought to answer the following sub-questions:

- To what extent do novice natural science teachers understand the nature and significance of current mentoring programmes in Gauteng schools?
- To what extent are the existing mentoring programmes helpful to novice science teachers in Gauteng?
- To what extent would mentoring effect performance of novice science teachers?
- What intervention strategies can be made available for mentoring novice natural science teachers to improve learning capabilities for students in Gauteng?

The motivation for or rationale underpinning this study was to highlight the many advantages that may flow from gathering ground-based information on the challenges faced by novice natural science teachers, which result in the high failure rate in science subjects in South Africa.

This research is of importance for it can contribute to the establishment of programmes and policies that will focus on ensuring that all novice natural science teachers in all schools received the required mentoring and induction.

Literature Review

The term “novice” has predominantly been used in studies for beginning or new teachers, and as Farrell (2012) notes, there is no clear-cut definition of a novice teacher in the literature. A novice could be anyone who is teaching something new for the first time or who has entered a new cultural context for the first time (Farrell, 2012). Some researchers view a novice teacher as a teacher with less than 5 years of teaching experience (Kim & Roth, 2011), while others (Haynes, 2011) allude to novices as teachers with 2 years of teaching experience.

According to Long (2016:12), a novice teacher “is an instructor training system graduate entering teaching as a profession.” A novice teacher is thus an instructor who began a new position of instructing in the wake of moving on

from a preparation establishment. A beginning teacher could also allude to an educator who began a new position of instructing, an educator who took up an advancement post, or an instructor who moved from one school or district to another (Nantanga, 2014). According to Ulvik, Smith and Helleve (2017) novice teachers are those teachers in their first year of education with no or little teaching experience.

According to Cuenca (2010), there is a huge difference between a novice teacher and an expert teacher. This can be attributed to, among others, their thinking, experiences, and handling of situations. In the following paragraphs we explore the differences between expert and novice teachers.

A novice teacher is relatively inflexible whereas an expert teacher is flexible. According to Cuenca (2010), an expert teacher deals with problems by involving predictable rules and routines achieved over a long career in teaching. Furthermore, an expert teacher does not restrict the teaching of students and is liberal in their teaching methods. This is because an expert teacher would have understood the complexity of the teaching environment (Scandura & Shriesheim, 1994). However, novice teachers are not flexible, for they follow certain established rules that they have learnt from their tertiary training and this, however, does not always work within a practical classroom setting. Therefore, the major difference between expert and novice teachers seems to be that the former is flexible whereas the latter is rigid.

A further difference between novice and expert teachers is that novice teachers have limited skills whereas expert teachers have much experience and many skills. Euade (2012) is of the view that expertise and skills development involve several things. Among these are trust in intuition, informed by evidence from theory and experience of specific situations, as the basis of discernment and judgment rather than unthinking compliance. In this regard, an expert teacher works on several fronts at any one time, with multiple goals which vary for different individuals and groups. This, however, cannot be said of novice teachers as they lack judgment and experience and need the help of mentors to navigate certain challenges.

Another difference between expert and novice teachers is that through their development, novice teachers follow rules and guidelines whereas expert teachers have deep reserves of tacit knowledge. Cuenca (2010) argues that expert teachers do not just comply with established rules and regulations but exercise a strong degree of autonomy based on their informed judgment. In other words, expert teachers bend rules and regulations in the interest of the learners. However, this cannot be said of novice teachers who follow strict rules of conduct and do not deviate from this model.

Within any profession, for effective results, there is a need for induction and mentoring (Draper, Broomhead, Jensen & Nokes, 2012). Therefore, a lack of on-site job training leads to organisational ineffectiveness, which in turn has diverse negative impacts on the achievement of organisational goals. The impact of a lack of structured induction and mentoring is quite devastating to novice teachers resulting in many leaving the teaching profession (Maxwell, Harrington & Smith, 2010). As argued by McCarra (2003), there is only one method of providing systemic support to novice teachers in their new profession, and this is through a programme-based development method in mentoring and induction. What does induction and mentoring entail in the teaching profession?

In a study conducted by Soares, Lock and Foster (2008), it was established that there was a significant correlation between induction and retention. This suggests that there is a need for induction programmes to focus on more than the standard basics to retain teachers in the profession.

Induction influences teacher's job satisfaction and efficacy. Wechsler, Caspary, Humphrey and Matsko (2010) indicate that teachers who had received progressively concentrated coaching and guidance in steady school settings showed more noteworthy improvement in their instructional practice.

In the same vein, Harland and Kinder (1997) suggest that changes in subject skills and knowledge, changes in confidence and self-esteem, a deeper educational understanding, a clearer rationale for actions, more considerations, a greater ability to change and greater contentment all emanate from induction of novice teachers.

Mentoring has also been argued to affect the emotional well-being of new teachers. Wechsler et al. (2010) reveal that teachers have self-confidence in teaching their subject through group consultations in which colleagues' experiences and methods were shared. Events like special meetings for beginner teachers helped them to get to know their colleagues and prevented them from feeling alone. The support of a mentor has a great impact (Mouton, 2001). Harland and Kinder (1997) report that despite differences between induction programmes, virtually all teachers who had received at least some support through an induction programme confirmed that it had a positive influence on their well-being.

Mouton (2001) emphasises that induction and mentoring programmes that guide and support novice teachers in their first years of teaching have always been crucial in developing sound teaching practice while also retaining teachers in the profession. Soares et al. (2008) are also of the view that induction and mentoring help with the development of knowledge and skills that novices

need to be successful in their first year of teaching. Cherubini (2007) argues that it is unreasonable to expect novice teachers to succeed like veterans from the initial entrance to the school, and it is unfair, especially if taking into account that it sometimes happens without any assistance. Induction and mentoring thus contribute to novice teachers' effectiveness and pedagogical practice, and it should be regarded as crucial for novice teachers' professional development.

Theoretical Framework

In this study we used the cognitive learning theory as it aids in the understanding of the impact of mentoring of novice natural science teachers. The psychological learning hypothesis was used to clarify mental procedures as they are affected by both inborn and extraneous components, which in the long run realise a persons' learning.

In particular, the social cognitive theory holds that people gain knowledge by watching others (Lent, Brown & Hackett, 1994). Santrock (2008) asserts that when individuals watch a model's conduct and the result of such conduct, they remember the process and use that to manage their consequent practices. A person does not adapt new practices exclusively by attempting them; individuals are rather reliant upon the replication of other's actions. In the context of this study, novice teachers, through mentoring, learn and replicate the actions of mentors for effective service delivery.

Bandura's (1995) social cognitive theory is divided into three fundamental, interrelated factors:

- **Personal:** It is crucial that mentors should check if the individuals have high or low self-efficacy towards behaviour;
- **Behavioural:** The mentors must check responses to individuals' behaviour; and
- **Environmental:** These pertain to aspects of the environment or setting that influence the individual's ability to successfully complete behaviour.

In the person-environment interaction for instance, human beliefs, ideas and cognitive competencies are modified by external factors such as a supportive mentor and an enabling schooling environment. In addition, the person-behaviour interaction, and the cognitive processes influence the behaviour of an individual and likewise, performance of such behaviour can modify the way that the individual thinks. Lastly, the environment-behaviour interaction, and external factors can alter the way in which an individual behaves. As stipulated by Bandura (1995), the cognitive theory clearly implies that for effective and positive learning to occur, an individual should have positive personal characteristics, display appropriate behaviour and be in a supportive environment. These tenets make the theory useful for this research, since mentors must exhibit positive behaviour.

The human capital theory was also used in this study, even though the theory is basically used in marketing-related fields. We found the human capital theory useful for its objectives of employee productivity through learning that may apply to the mentoring of novice teachers. In general terms, the theory relates to any knowledge or characteristics that an employee within an organisation may possess and how these contribute towards organisational productivity. In reference to the research objectives of our study, this theory can relate to the knowledge acquired during teachers' official training and during the mentorship programme and how these relate to their output.

The term, "human capital", was coined in the early 1960s; Schultz (1961) defines the theory as comprising the knowledge, skills and abilities of the people employed in an organisation. Becker (1993:3) defines human capital as the "knowledge, information, ideas, skills, and health of individuals." Thomas, Smith and Diez (2013:3) define human capital as the "people, their performance and their potential in the organization." The inclusion of the term "potential" is important, as it indicates that employees can develop their skills and abilities over time. Novice teachers can increase their knowledge through mentorship. Dess and Picken (2017) provide a comprehensive understanding of human capital, as they suggest that the theory consists of the capabilities, experience, skills and knowledge of an individual acquired over time through learning on the job.

The human capital theory delineates mentoring as one of its most fundamental attributes. According to Klinge (2015), mentoring is a customary procedure where accomplished individuals aid someone else in the improvement of their own thoughts, learning, and expert capability. The job of a guide is to persuade and help the mentee to think about their encounters to encourage their advancement withing a specific calling. The human capital hypothesis in this manner clarifies that the mentor's very own experience is of specific incentive to the mentee. Besides, tutors are especially sharp at encouraging two-fold circle learning as they can urge mentees to consider current learning and how future learning might be improved (Klinge, 2015). Mentoring within the academic discourse requires mentors to serve as role models and supporters for novice teachers. This requires pairing a new teacher with a senior teacher within the school for improved performance. Mentoring from a human capital perspective promotes on-the-job learning and can complement formal training (Armstrong, 2014).

Research Methodology

Research methodology encompasses the complete research process, approaches, procedures and data

collection or sampling used (McMillan & Schumacher, 2001). This research is premised on qualitative data collection methods.

A case study research design was used. "Through case study research the researcher is able to develop an understanding of a complex issue or object and can extend experience or add strength to what is already known from previous research" (Flick, 2011:56). Creswell (2014) highlights that case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationship. In this study case study designed assisted us to collect data on how mentor programmes can yield positive results to improve teacher confidence and retention, which will reduce teacher attrition. Qualitative research is frequently used in academic research; it was used in this research as it assisted us to understand the needs of novice natural science teachers in Gauteng. Prior to the actual study, we piloted ideas and developed the impact of mentoring of novice natural science teachers.

This research was conducted at three primary schools in Ekurhuleni North, Gauteng province. Two novice teachers from three primary schools who have been teaching for between 1 and 5 years at each school and three mentors who have been teaching natural science at targeted schools participated in this study.

Since we tried to determine the effect of mentoring of novice natural science teachers in Gauteng, the sample size was destined and dependent on hypothetical immersion. Most extreme variety examining was used, since the examination tries to catch a wide scope of viewpoints identified with the effect of preparing and advancing on hierarchical execution. A sample size of 11 respondents was used.

Data Collection Methods

Qualitative research methods, namely interviews and observations, were used as primary data gathering methods, and secondary data were collected through document searches. Structured interviews were used in the research as they can be conducted quickly, are easy to manage and are specifically used to explain specific inquiries. Furthermore, structured interviews investigate the perspectives, encounters, opinions and inspirations of individual members. Mouton (2001) indicates that structured interviews are verbally directed surveys in which predetermined questions are posed without allowing for follow-up questions to participants' comments that warrant further elaboration. Creswell (2014) contends such interviews allow the specialist to investigate in order to understand a specific phenomenon.

The interviewees were asked questions on their background or personal information. The questions covered details regarding their

experiences, beliefs and feelings regarding induction and mentoring. Another set of questions were designed to gather data on the experiences of the mentors while the last batch of questions covered the experiences of the relevant policymakers regarding the policy on induction and mentoring in South African schools.

Data analysis is done in order to present the collected data in a coherent format to address the research problem effectively. In this study we used thematic analysis as method for data analysis. The data were presented in the form of themes, categories and codes in a schematic form from which the meaning of the data could be deduced. As indicated by Mouton (2001), structured interviews are verbally directed surveys in which a rundown of predetermined inquiries are posed, with practically no variety and with no degree for follow-up inquiries to reactions that warrant further elaboration. Creswell (2007) contends that in these kinds of interviews there is space for testing in which the specialist will look to comprehend a specific marvel. In this examination we used structured interviews for they are moderately speedy and simple to regulate and are of specific use for explanation of specific inquiries. Furthermore, an interview guide was in the interviews. To follow ethical considerations and to ensure anonymity and protect the participants from harm, we referred to the participants by number: Participants 1 to 8.

Data Analysis

We sent out 10 invitations to request participants to participate in the study; only eight responded positively to the invitation – a response rate of 80%. Creswell (2014) indicates that in a qualitative study the response rate should be more than 60% in order to elicit ideal meanings, feelings and perceptions from the target population. The response rate in this study was sufficient to transfer the findings to similar contexts, even though generalisations cannot be done from such a small sample.

Thematic analysis was used for data analysis. Thematic analysis is a qualitative research method that focuses on finding themes within raw data. This method establishes relationships between data for purposes of data reduction (Flick, 2011). Coding of the participants' statements supported the identification of themes that represented a classification of the raw statements. This qualitative approach to data analysis incorporated the categorisation of the factors that explained the success and failures in mentoring programmes — that is, the experiences, meanings and the explanations as experienced by the interviewees (Glaser, 1992).

Clusters of codes emerged from the raw data that indicated what the participants contributed as

successes and failures of the mentoring process experienced by novice teachers, their mentors, and the policymakers. The answers obtained from the research participants were analysed with the four steps of the grounded theory coding procedure: data collection, open coding, axial coding and selective coding.

The bulk of the data analysis process was aimed at issues relating to the successes and failures of the mentoring programmes. Among others, Hill and Hupe (2008), Makinde (2005), Mouton (2001) and Onkware (2015) devote considerable attention to the factors which tend to influence the implementation of public policies and plans. The focus of the grounded theory-based questionnaires was on the problems that the stakeholders thought influenced the implementation of mentoring programmes in the selected schools.

Limitation of the Study

Only three primary schools in Ekurhuleni North participated in the study, thus the results of this study cannot be generalised.

Results, Findings and Analysis

Thematic analysis was used to analyse the raw data. Thematic analysis is a qualitative research method that focuses on finding themes in raw data. This method establishes relationships between data for purposes of data reduction (Flick, 2011). Coding of the participant's statements resulted in the identification of themes that represented a classification of the raw statements. This qualitative approach to data analysis incorporated the categorisation of the factors that explained the successes and failures in the mentoring programmes – that is, the experiences, meanings and explanations as experienced by the interviewed participants (Glaser, 1992). The results are discussed in terms of four sub-objectives and the emerging themes.

Clusters of codes that represented what the participants regarded as the successes and failures that novice teachers, their mentors and policymakers experienced in the mentoring processes emerged from the raw data. The answers obtained from the research participants were analysed using grounded theory coding procedure in four steps: data collection, open coding, axial coding and selective coding. The main objectives of this are discussed below.

Objective 1: Evaluate the Nature of the Current Mentoring Programmes in Place for Science Teachers in the Gauteng Province

The first objective with the study was to evaluate the nature of the current mentoring programmes in place for science teachers in Gauteng. This objective was premised on the need to understand

the current procedures and methods used to mentor novice science teachers. This objective serves to outline that it is important to understand the nature of mentoring to understand the impact of mentoring on novice science teachers.

Method of empowering the novice teacher

Participant 1 said the following: “*Mentoring of novice teachers refers to the process in which new teachers are empowered to be effective in their work-related tasks and become true professionals in the academic profession.*”

Participant 2 argued as follows: “*Mentoring of novice teachers can be understood as the opportunity given to the senior teachers in terms of guiding a novice teacher and preparing novice teachers as they embark on their teaching profession.*”

Participant 3 simply said: “*Mentoring of novice teachers is the process in which a new teacher is equipped on how to deal with situations they come across.*”

This is in line with Eby (1997) who explains that mentoring is an intense developmental relationship through which advice, counselling, and developmental opportunities are provided to a mentee by a mentor, which, in turn shapes the mentee’s career experiences. Furthermore, Sweeney (2008) articulates that mentoring is the complex developmental process that mentors use to support and guide their protégés through the necessary transactions that are part of learning how to be effective educators and career-long learners.

Method of establishing a vision and mission of the novice teacher

Mentoring of novice teachers can also be understood as the process in which the senior teacher helps the novice teacher to set up a vision and mission for their success:

Mentoring of novice teachers is the process in which the new teachers are helped on how to structure and establish their vision and mission within the new career. This is because the teachers are given support in their first years as teachers. (Participant 6)

Ragins (1997) explains that a mentor is an individual with advanced experience and knowledge who is committed to providing upward mobility and support to mentees’ careers. This means that mentors are knowledgeable people whose aim is to develop novice teachers in their careers. After mentoring the mentees are more likely to be promoted than those who did not get the mentoring experience. Therefore, mentoring involves a senior teacher or a more established teacher guiding new teachers on how to set their vision and mission in the teaching discourse through empowering them on how to conduct their day-to-day routine.

Current nature of mentoring of novice teachers

In the study we also gathered information on the current strategy used to mentor novice teachers. These methods are discussed below.

Training and development

The first strategy is through training and development.

The current strategy includes an induction process in which a senior teacher adopts novice teachers and guides them in the discourse of teaching (Participant 1).

The current state of mentoring of novice teachers is premised on giving new teachers the skills and strategies such as how to handle learners with special needs, how to handle work-related pressure and how to handle a class with a high ratio of learners as compared to the teacher amongst other strategies. (Participant 2)

The mentor-mentee relationship is the fundamental point underpinning mentoring of novice science teachers within schools in Gauteng and in South Africa at large. Bozeman and Feeney (2007) state that mentoring has several functions and one of these is training and development in which the advice and modelling about career development behaviour are affected by the senior teacher. As mentoring is normally offered to an inexperienced professional, career development becomes the focus of mentoring through training and development.

Skills development through psychological support

We also gathered that skills development is a strategy used to mentor novice teachers. Participant 5 argued that “[t]he current strategy for mentoring novice teachers is premised on assisting the new teacher on how to interpret learner behaviour and communication and help the novice teacher discover how to further their own learning.”

Participant 7 agreed: “*This mentoring for career development is important for it comes with support from both angles, including emotional support, personal support and psychological support.*”

Bozeman and Feeney (2007) state that support for career development mentally prepares the novice teacher to gear up and be effective within the teaching environment. Therefore, skills development through mental and psychological support is an important strategy used to mentor novice teachers.

Technical support to enhance communication skills and manage the curriculum

Another strategy is that of teaching novice teachers how to enhance their communication skills and how to manage the curriculum. According to Kidd, Brown and Fitzallen (2015), the educational sector is premised on the need to effectively communicate

with students so that the mentoring strategies adopted ideally seek to enhance the communication skills of the new teacher.

The mentor has to guide the novice teacher with curriculum teaching strategies and communication skills for the new teacher to be effective. This is because curriculum management and effective communication with the learners are the fundamental tools for successful teaching in the classroom. (Participant 7)

The mentor ideally teaches the novice teacher on how to manage the curriculum, prepare for classes and monitor students with special abilities, and all these are directed under the ideal that effective communication with learners is the ideal way to achieve the goals and objectives of the novice teacher. (Participant 8)

According to Kidd et al. (2015), during mentoring, the mentor and the mentee share values, knowledge and experience that impact on communication skills that are ideal in enhancing the success of the novice teacher. In this regard, the mentoring strategies adopted within schools include an understanding the science curriculum and how to effectively communicate with the students.

Objective 2: Determine the Importance and Relevance of Mentoring Novice Natural Science Teachers in the Gauteng Province

As stipulated in the first objective, mentoring has many strategies that are used to achieve several goals and objectives. However, these strategies lead to an understanding of the importance and relevance of mentoring novice natural science teachers in the Gauteng province. The importance of mentoring novice teachers relates to the need of the ideal situation and the effect thereof. Relevance refers to the pertinent issues that the mentoring of novice teachers has on the teaching discourse. This is the reason why we referred to importance and relevance as separate terms.

Importance of mentoring novice teachers

From the findings of the study we gathered that mentoring novice teachers is important in several spheres – for the teacher, the learners and the academic discourse in general.

Raising awareness

Firstly, mentoring of novice teachers is important for it raises awareness on how to conduct classes.

Mentoring of novice teachers is important for teachers need to be aware of how they teach their students and they also need to be aware of how their learners grasp knowledge, therefore mentoring allows these teachers with the opportunity to approach their teaching to the best of their abilities. (Participant 2)

Teachers need to be aware of what and how they teach their students and also need to be aware of how their students are doing, thus mentoring is a positive step towards achieving this (Participant 5).

Kidd et al. (2015) state that the aim of mentoring is to achieve the best results capitalising on the teacher-student relationship and all these are established through mentoring, for it raises awareness among novice teachers on how to conduct their day-to-day business. Awareness, therefore, is the ability to understand how the students are doing and how to persuade and monitor the students' success. Therefore, mentoring of novice teachers is important for it helps raise the teacher's awareness.

Wide range of expertise

Secondly, mentoring of novice teachers is important for it leads to a wide range of science teacher expertise to achieve the best results within the classroom.

Mentoring of novice teachers is important for a wide range of expertise in the field of paper and it enables the capability to gather information and knowledge about natural science which might have been lost and has not been widely shared. (Participant 3)

Mentoring of novice science teachers is important for it helps to check on the training that science teachers received and how relevant it is within the teaching discourse. Mentoring therefore equips the novice teacher on the lacking practical experience and how to improve over time. (Participant 7)

Education is all about gathering knowledge to impact positively on human life (Scandura & Shriesheim, 1994). Therefore, mentoring novice teachers is important for the mentee can gather knowledge from the mentor which he/she did not gather during their years of training. Furthermore, this interchange of science knowledge directly leads to the growth of the learner, which is the goal of education. Mullen (2000) points out that although mentoring relationships are usually based on levels of higher authority or expert knowledge, in recent days, mentoring has taken a multidimensional view that frames mentorship as a flexible and interactive process. Therefore, mentoring of novice teachers is effective for it leads to sharing of expert knowledge.

Capacity to handle laboratory classes

Thirdly, mentoring of novice teachers is important for it capacitates the novice teacher on how to handle laboratory equipment and chemicals to the benefit of the student.

It is imperative that novice science teachers acquire mentoring for science requires a skill of handling laboratory equipment for some of these equipment and chemicals are dangerous and when teaching students, the process can be difficult, therefore there is a need for effective mentoring to sharpen the teaching skills (Participant 4).

In addition, Participant 6 argued that mentoring of novice teachers was important because "there is need to impart teaching experience to the novice

science teachers and to show them the basics of how to deal with the field of science as a whole.”

Participant 8 argued that “mentoring is important for it allows the mentor to teach the mentee on how to schedule their teaching episodes and address their point of need for effective delivery within the classroom.”

The discourse of science teaching often involves practical activities that require the use of the science laboratory. However, if chemicals are not used appropriately, they pose a threat to the learners’ well-being. Therefore, mentoring equips the novice teacher to manage laboratory processes and scheduling so that resources are not wasted and that no harm comes to the learners (Sayer, 2002). In this regard, mentoring is important for it allows the mentee to become knowledgeable in managing practical laboratory classes.

Relevance of mentoring novice science teachers

Since we distinguished between the relevance and the importance of mentoring, we discuss the relevance of the mentoring of novice science teachers below.

Knowledge, wisdom and skills impartation

Firstly, we gathered that mentoring of novice teachers is relevant, because it leads to the passing on of knowledge, skills and wisdom to the novice teacher.

Mentorship is relevant within the Province, and the Country at large for it allows the impartation of knowledge, wisdom and skills by the matured and experienced teachers. Its relevance therefore entails fortifying the mentees in their profession and thus strengthening the education system. (Participant 1)

In order for one to be expert teachers within the science profession, they need to be mentored and helped in knowing all what it takes for teachers to be experts in terms of subject language, terminology, practical, communication and other important teaching variables. (Participant 2)

Mentoring is thus relevant for it leads to the development of teaching skills and the knowledge of the novice teacher. This agrees with Megginson and Clutterbuck (1995) who define mentoring as the off-line help by one person to another in making significant transitions in knowledge, work or thinking. Off-line help is the assistance given by a knowledgeable person to a less knowledgeable one. This helps to ensure that knowledge and skills in the teaching profession are enhanced.

Ability to become a better teacher

Secondly, mentoring of novice science teachers is relevant for it guides the novice teacher to become a better teacher.

According to Participant 3, “[t]he relevance of mentoring novice science teachers is that it leads them to become better teachers as mentoring provides the ability to learn from the experienced.”

Participant 4 argued that “mentoring is relevant for novice teachers who do not have the know-how on delivering education to learners; therefore, mentoring ensures that a sense of direction and expertise are gathered.”

Furthermore, Participant 5 argued that, “in order for one to become a better teacher, there should be mentorship taking place for them to be well prepared to face this new profession.”

Participant 7 argued that “mentors are knowledgeable and experienced so they help novice science teachers to adopt a direction in relation to how to prepare a new curriculum, learning strategies and how to hold practical lessons.”

Ideally, mentoring can help any individual improve in a particular ability. This is the rationale of mentoring for it helps a novice teacher to become informed. According to Leedy (2014), mentors are knowledgeable people who aim to develop novice teachers in their careers. After mentoring, the mentees are more likely to be promoted than those who did not have the mentoring experience (Leedy, 2014). Therefore, mentoring is essential as it helps novice teachers become better teachers.

Objective 3: Understand the Effects and Impact of Mentoring Novice Science Teachers in the Gauteng Province

According to objective 3 we focused on the interpretation of the effects and the impact of mentoring novice science teachers in the Gauteng province. Research objectives 1 and 2 arguably gave rise to successive objectives and focused on understanding, the nature, importance and relevance of mentoring novice to address the need to understand the impact of mentoring novice teachers.

We gathered that there were various influences of mentoring novice science teachers.

Excellent and effective teaching

Mentoring of novice teachers has an impact as it leads to the creation of an effective and excellent teaching environment. According to Participant 1, “the impact of mentoring novice science teachers is stipulated through the outcome of effective and excellent teaching, because relevant knowledge would have been disseminated thereby enabling the novice teachers to prosper in the scientific field.”

According to Participant 2, “mentoring novice teachers ensures that these teachers become the best within the science profession as they have acquired the basic training and development from the mentoring processes.”

Generally, the mentoring of a novice teacher influences the job satisfaction and teacher efficacy which lead to excellent and effective teaching. According to Wechsler et al. (2010), teachers who received more intensive mentoring, whose induction had a strong focus on instruction, who

received a variety of induction support, and who worked in supportive school contexts improved their instructional practice more.

It is in this regard that one can argue that effective and excellent teaching is a result of the mentoring of novice teachers.

Teacher retention

We also gathered that mentoring of novice teachers lead to higher levels of teacher retention. Participant 8 was of the opinion that “*mentoring novice teachers ensures that a certain degree of career development and guidance is modelled in regard to the teacher; therefore, there is career retention as the new teacher would have achieved all the moral, technical and psychological support.*”

Participant 6 agreed:

Just like training and development mechanisms that are part of organizations, mentoring novice teachers can be viewed in that perspective for it leads to employee satisfaction. Satisfied employees stay within the vicinity of the workplace and work to the best of their ability to ensure organisational success. This is the same with mentoring novice science teachers who gather the ability and comfort to be effective.

According to Ingersoll and Smith (2004), regular partnerships with experienced teachers that went beyond basic induction resulted in a 29% reduction in attrition rates. In this regard, most effective induction programmes offer plenty of support in the form of providing mentors from the same discipline prospects to engage in group or joint planning activities (Ingersoll & Smith, 2004). This shows that there is a high retention of teachers in cases where effective mentoring has been put in place. Therefore, there is a significant correlation between mentoring and retention.

Improved service delivery by teachers

The mentoring of novice science teachers has led to improved service delivery by the new teachers. Participant 3 argued that “*mentoring impacts the novice teacher for it improves the delivery of science as a subject, which is important in the socio-economic development of South Africa.*”

Participant 5 argued that “*mentoring novice teachers has an impact on producing the novice teacher with the required teaching experience.*”

In most cases, novice teachers do not have the required material to be effective in their day-to-day teaching profession; therefore, mentoring ensures that this gap is filled and that a certain level of progress on the part of the novice teacher's career is enhanced. (Participant 6)

Harland and Kinder (1997) suggest that changes in subject skills and knowledge, changes in the confidence self-esteem, deeper educational understanding, clearer rationale for actions, more consideration, greater ability to lead change and

greater contentment all emanate from induction of novice teachers and impact service delivery.

Emotional and psychological well-being of teachers

The impact of the mentoring of novice science teachers is that it develops teachers' emotional and psychological well-being, which leads to increased performance, among other positive attributes. According to Participant 5, “*mentoring impacts on the well-being of the novice teacher for it leads to a gain in confidence, feeling the support of the mentor and other psychological support that lead to increased service delivery.*”

In a study conducted by Wechsler et al. (2010), several teachers mentioned that they gained self-confidence through group meetings in which they could hear about their colleagues' (who weren't all that successful either) experiences. Events like special meetings for beginner teachers helped novice teachers to get to know their workmates and prevented them from feeling alone. The support of a mentor makes teachers feel supported (Mouton, 2001). Harland and Kinder (1997) report that in spite of differences between induction programmes, virtually all teachers who had received at least some support from an induction programme confirmed that it had a positive influence on their well-being.

Objective Four: Recommendation on the Interventions that can be Proffered to Improve Mentoring Novice Natural Science Teachers for Improved Teaching Conditions in the Gauteng Province

We sought to collect recommendations on interventions that can be provided to improve the mentoring of novice natural science teachers for improved teaching conditions in the Gauteng province. We first sought to gather recommendations on the role of the government and respective authorities on how to come up with policies and mechanisms for effective mentoring and recommendations based on the general understanding of the research problem.

Connection of the mentors with the mentees

We gathered that there was need for the government to initiate a process that ensures that a relationship and connection between the mentor and the mentee exists.

The experts, particularly professors, doctors and other proficient members in the field of study who take part in these mentorship programmes, should be connected to the youth who in most cases are the novice teachers, to allow the sharing of knowledge and skills in the related field. (Participant 1)

This recommendation comes from the challenges faced by both the mentor and the mentee in addressing the generation gaps that often exists between these two groups. There is a need to

develop processes and solutions that address these gaps in order for mentoring to have an impact on novice teachers.

Mentoring programme for science teachers

With the study we gathered that there was a need for a specific mentoring programme targeting natural science teachers as it seemed as though the existing mentoring strategy was aimed at all teachers and was not specific.

There is need for mechanisms that ensure that natural science teachers are not neglected by these mentorship programmes for in most cases, mentorship initiatives tend to neglect on these teachers. An effective mentoring of science teachers will therefore assist schools as well as learners to improve in science subject. (Participant 1)

Participant 4 agreed and said that *“the science field should be supported in the recruitment of effective and efficient mentors to enhance the continuous support of mentoring on the novice teacher.”*

Furthermore, Participant 7 argued that *there should be common classroom practices in which mentors are actually invited to the classroom and evaluate the process in which the novice teachers conduct their day-to-day job related tasks. Furthermore, this process should be vice versa as the mentee should constantly attend classes of the mentor and understand how studies are being conducted.*

In other words, there should be enough mentors to guide natural science teachers in order for mentoring to have an impact on the novice natural science teachers.

Enough resources for mentoring

We also gathered that the government should avail enough funds to ensure that mentoring is effective. According to Participant 6, *“the government should make sure that there are enough funds for the mentoring programme to achieve its stated goals and objectives. Funding ensures that there is enough equipment and human capital for an effective mentoring process.”*

In addition, Participant 8 argued that *“the government must come up with a strict policy that ensures that all novice teachers are effectively part of the mentoring process and funds for such a programme should be readily available.”*

We thus gathered that there was a need for sufficient resources to ensure that mentoring impacts novice natural science teachers.

Development of a natural science mentoring programme

From the findings we gathered that there was a need for the development of a mentoring programme that effectively targeted novice natural science teachers.

There is need for a development of a programme that caters for the needs of novice natural science teachers and there is need for the allocation of a

budget intended for scholarships, infrastructure and workshops where opportunities for sharing knowledge in regards to natural sciences are catered for. (Participant 6)

Participant 6 further argued that

there is need for a special budget targeting natural science teachers and the creation of mentoring initiatives for them alone. This is because the natural sciences sections have been affected for a long time and there is need to address these challenges in a bid to create an effective and efficient base for natural sciences.

Ideally, the development of an effective natural science programme with ideal resources allocated to the programme will ensure that mentoring impacts novice natural science teachers.

Training and development of mentors

We further gathered that for mentoring to impact novice natural science teacher, there is need for mentors to also undergo a comprehensive training and development programme.

Participant 8 was of the opinion that *“there is need for training and development of the mentors to ensure that they are fully equipped to guide the novice teachers in curriculum management, communication skills and other important teaching aspects.”*

Participant 5 also argued that *mentors should be taught on how to be effective in the mentoring process and remain patient amongst other inter-personal skills. The mentor impacts directly on the path of the mentee, therefore there is need to ensure that the mentor is up-to the task.*

Training and development are, therefore, essential in ensuring that mentorship impacts novice natural science teachers.

Conclusion

From the study we concluded that mentoring impacted novice science teachers in that it resulted in the creation of an effective and excellent teaching environment. The mentoring of novice science teachers will result in effective and excellent teaching, because relevant knowledge would have been disseminated thus enabling the novice teachers to prosper in the science field. Furthermore, mentoring exerts a powerful influence on novice science teachers as it leads to higher levels of teacher retention. Mentoring novice teachers ensures that a certain degree of career development and guidance is modelled to equip the teacher, therefore, there is career retention as the new teacher would have had all the moral, technical and psychological support. In addition, the impact of mentoring novice science teachers would lead to improved service delivery by the new teacher. Mentoring impacts the novice teacher for it improves the delivery of science as a subject, which is important in the socio-economic development of South Africa. From the study we also concluded that the impact of mentoring novice

science teachers was that it developed the emotional and psychological well-being of teachers, leading to, among other positive attributes, increased performance. Mentoring impacts the well-being of the novice teacher for it leads to a gain in confidence and increases service delivery.

In summary, the findings from the study help us understand the impact of mentoring novice natural science teachers. This study, therefore, identified what mentoring referred to, the nature of mentoring and the importance and relevance of mentoring, and the impact of mentoring on novice natural science teachers. Recommendations from the study are discussed below.

Recommendations

We recommend that the government and relevant stakeholders prioritise financial and human capital resources for mentoring to impact novice natural science teachers. Firstly, there is need for a budget that is specifically allocated to meet the infrastructure, human capital and other needs that facilitate the mentoring of science teachers. Furthermore, there is need for effective resources that support training and development camps as well as workshops and conferences that are targeted at empowering novice science teachers. From the findings we understood that there was a need for resources and effective mentoring of novice science teachers.

We recommend that the government and schools need to initiate programmes that equip mentors to be effective. For mentoring to impact positively on novice natural science teachers, there is a need for the mentors to be fully equipped and motivated to be part of this process. If a trainer is not capacitated, the trainee will not learn anything. This is the reason why we recommend that all stakeholders should ensure that mentors are capacitated to do so.

We also found that there was a need for specific mentoring programmes targeting natural science teachers. This will ensure that natural science teachers are not left out of these mentorship programmes. Therefore, the science field should be supported in the recruitment of effective and efficient mentors to enhance the continuous support of mentoring for novice teachers.

Further Research

This study was premised on the need to analyse the impact of the mentoring of novice science teachers in the Gauteng province. The following recommendations are made for future studies:

- Future studies can look at the role of the government in supporting the mentoring programme of novice teachers across all disciplines, as the government plays a critical role in the implementation of this process that can benefit the

educational sector in South Africa.

- Further studies could also use different tools to achieve the same objective. Since this study was exploratory, using the quantitative approach with a larger sample can survey the impact of the mentoring of novice natural science teachers within the country at large.
- We also recommend that a comparative study be conducted between provinces in trying to understand the impact of mentoring novice natural science teachers.

Authors' Contribution

REM wrote the article based on her masters' dissertation supervised by MPR.

Notes

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