

# AN ANALYSIS ON WHY THE MATHEMATICS AND INTEGRATED NATURAL SCIENCES BASIC EDUCATION TEACHERS DIPLOMA (BETD) GRADUATES OPTED TO FURTHER STUDIES IN THEIR AREAS OF SPECIALISATION AT THE RUNDU CAMPUS, UNIVERSITY OF NAMIBIA

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## Abstract

*This study was conducted to find out why the BETD Mathematics and Integrated Natural Sciences graduates currently studying at Rundu Campus of the University of Namibia (UNAM) opted to further their studies in their areas of specialisation. The profile of the BETD graduates can shed some light on the current training of teachers by the Faculty of Education (FoE) at the Rundu Campus. These graduates were trained in either Upper Primary (UP), grades 5-7 level, or Junior Secondary (JS), grades 8-10 (JS) level, which UNAM did not offer before the merger. Currently the FoE is offering a 4 year Bachelor of Education Honours (B. Ed. Honours) degree at Upper Primary (UP) level, grades 4-7. This enables those who did UP level to articulate in 2<sup>nd</sup> year, while those who did JS level have to start from year 1, due to the different levels of studies, subject content, skills and methodology acquired. A total number of 26 participants were involved in this research, 11 females and 15 males. The study employed semi-structured interviews, questionnaires, and followed up with stimulated recall interviews to establish their perceptions regarding the reasons why they opted to further their studies at the Rundu Campus, which are mainly as follows: higher level subject content, skills, methodology, distance, finances, accommodation, and work stations that are within the regions.*

## Introduction

The merging of the former four Colleges of Education in Namibia and the University of Namibia (UNAM), Faculty of Education (FoE) in January 2011 emerged a widely identified need for quality teacher education.

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The Faculty of Education is the largest of eight Faculties at the University of Namibia. The Faculty comprises eight departments. The Department of Mathematics, Science and Sport Education (MSSE) is one of the departments in the Faculty of Education of the University of Namibia. It is mainly responsible for training teachers for Mathematics, Integrated Natural Sciences, Home Ecology, Agriculture, and Sports Education at Upper Primary and Secondary levels of schooling in Namibia. It further offers qualifications at post-graduate level in Mathematics, Science, and Sport Education. To ensure equitable access to teacher education programs across the country, the undergraduate programs are offered on six different campuses across Namibia, and at all Centres for Open, Distance and E-Learning (CoDeL). The former colleges, now satellite campuses (Rundu, Hifikepunye Pohamba, Katima Mulilo, Khomasdal) of the University of Namibia, offer both the B. Ed. degree in Pre- and Lower Primary, and Upper Primary Education, preparing teachers to teach in grades 0-3, and grades 4-7. However, the Hifikepunye Pohamba campus recently started offering a 4 year B. Ed (Hons) degree at Secondary level, grades 8-12. The B. Ed. (Hons) degree is at level 7 on the Namibia Framework Qualification Scale (Ministry of Education, 2013).

This research study focuses on the effect of improving teachers' qualifications on learners' academic performance in Mathematics and Integrated Natural Sciences. The link between teachers' paper qualifications, including experience, and learners' performance, is an area of continuous controversy, with some studies finding none or small effects on certification and experience, and others finding significantly positive effects (Goe, 2007).

### **Significance of the Study**

This study provides a considerable amount of useful and important information about how qualifications play an important role in terms of learners' achievements in Mathematics and Integrated Natural Sciences in both short and long term for attainment of Vision 2030 of the Namibian government. Thus the benefits of this research study are as follows: teachers will find the results useful in guiding their search for further studies; schools will benefit from better qualified teachers and thus improve on learners' achievement scores; teacher education institutions will find the information useful in helping to tailor suitable programs to meet the professional upgrading needs of teachers; curriculum developers will benefit in terms of information gathered to improve on the curricula being implemented at various levels in Namibian schools, other education centres, and institutions of higher learning in Namibia; and learners benefit in terms of better qualified teachers who will offer quality education and hence improve learners' performance in Mathematics and Integrated Natural Sciences. When learners' performance improves, they are able to study further and attain higher qualifications, which will, in turn, give them opportunities to get better paying jobs. This will help in eradicating poverty in many Namibian households. This concurs with a statement from a speech by the founding president of the Republic of Namibia, Sam Nujoma, who said that the only way poverty and hunger can be fought, is by ensuring that children are given education. "We

must now ensure that our children go to kindergarten, primary and secondary school up to university” (Njovu, 2014).

### **Theoretical Framework**

The theoretical framework for this research is outlined in accordance with the observation that the majority of teachers teach very similarly to their own teachers, as observed by Dan Lortie in 1975 (Davis & Andrzejewski, 2009). Unlike with other occupations, people who join the teaching profession had opportunities to observe their teachers and lecturers at work. Davis and Andrzejewski (2009, p. 1) noted that many of the beliefs teachers hold about teaching originate from personal experiences as students, as well as from other personal experiences, such as family traditions and values, social encounters, community participation, popular culture, perceived teacher preparation, teacher observation, professional development, and encountered scholarly literature.

### **Literature Review**

Recent research has shown that teacher quality is the single most important variable in determining learners’ achievement (American Federation of Teachers, 2000, as cited in Mulkeen, Chapman, DeJaeghere, & Leu, 2007). Improvements in teacher education are frequently suggested as the solution to educational problems, such as a lack of subject knowledge, skills and methods of teaching in their areas of specialisation, research, and instructional materials. Pre-service teacher education is the most widely used intervention to raise instructional quality. It is also among the most expensive undertakings. Not only are the direct costs of such courses high, but teachers once trained often receive higher salaries, raising the long-term recurrent cost of education (Lockheed & Verspoor, 1991; Chapman, Chen, & Postiglione, 2000). These could be some of the reasons why the participants in this study opted to upgrade their qualifications.

The lack of teachers in Mathematics and Science is evident in Francophone African countries, and has resulted in the subjects not being taught, or being taught by non-subject specialists (Caillods, 2001). This is also evident in Namibia where Mathematics and Integrated Natural Sciences are being taught by unqualified teachers when qualified teachers are not available (Hausiku, 2015).

Professional development, in a broad sense, refers to the development of a person in their professional role (Villegas-Reimers, 2003, as cited in Ilukena, 2008). More specifically, “teacher development is the professional growth a teacher achieves as a result of gaining increased experience and examining his or her teaching systematically” (Glatthorn, 1995, p. 41). Other scholars, such as Ganser (2000, as cited in Ilukena, 2008), found that professional development includes formal experiences (such as attending workshops, professional meetings, and mentoring), and informal experiences, such as reading professional publications, and watching television documentaries related to a specific academic discipline, to mention but a few. Professional development provides teachers with opportunities to deepen their understanding

of academic disciplines and pedagogical principles and to gain the necessary knowledge to rapidly integrate into ever-changing educational technologies.

Furthermore, international research has shown that there is a positive correlation between teachers' knowledge of their subject and their impact in the classroom (Rice, 2003). In many cases, teachers' lack of understanding of the principles of their subject may impede their teaching. This is especially true in subjects such as Mathematics. However, teachers may acquire appropriate understanding through subject-specific pedagogical courses more effectively than through the improvement of their academic qualifications in their subjects (Wilson, Floden, & Ferrini-Mundy, 2001, as cited in Mulkeen, et al., 2007, p. 27).

In addition, modern research has also revealed that to bring about effective learning in Mathematics and Integrated Natural Sciences classrooms, teachers need a deep understanding of subject content, pedagogical content knowledge, didactical knowledge, curriculum knowledge, classroom experience and knowledge of teaching materials, and how to deliver them (Brown, 2003; Ball, Hill, & Rowan, 2005; Ball & Bass, 2000; Kilpatrick, et al., 2001, as cited in Ilukena, 2008; Shulman, 1986; Shulman & Wilson, 1987). In this research paper, these concepts are explained as follows:

**Content Knowledge** refers to concepts, use of techniques, and reasoning in Mathematics and Integrated Natural Sciences.

**Pedagogical Knowledge** is subject independent and deals with general principles of education, for example, theories of learning, sociological, psychological, philosophy and ethical aspects, its functions, classroom management, and assessment.

**Didactical Knowledge** is the knowledge regarding the conditions and ways of Mathematics and Integrated Natural Sciences teaching and learning, and captures both the link and the distinction between knowing something for oneself, and being able to teach others to know it.

Therefore, if Mathematics and Integrated Natural Sciences teachers are to help learners to develop concepts, they themselves should have a thorough understanding of key concepts and the pedagogy of concepts (Sichombe, 2007). But knowledge of the conceptual structure of the topic is also necessary for the teacher to properly understand the concepts. Knowledge of a concept alone is not enough; teachers need to understand ways of representing the concept to learners. This view has been supported by Shulman and Wilson (1987), who argue that teachers need both subject matter knowledge and pedagogical content knowledge. Teachers should have a clear understanding of how conceptual development is achieved, as well as an understanding of how various strategies and resources contribute to the acquisition of conceptual understanding (Van Harmelen, 1999, p. 6). Only teachers with conceptual understanding will be able to engage their learners in productive conversation about multiple ways to solve mathematical and scientific problems. Teachers with a weak conceptual knowledge of Mathematics and Integrated Natural

Sciences tend to only demonstrate procedures to learners, and then give them repetitive opportunities to practice the procedures.

Apart from knowing the five knowledge strands above, these Mathematics and Integrated Natural Sciences teachers need to know the followings aspects as well:

**Curricular Knowledge** consists of instructional materials, reinforcement devices and teaching media.

**Knowledge of learners and their characteristics** include teachers' knowledge of learners' weaknesses and strengths.

**Knowledge of educational contexts** refers to knowledge of school board politics and community.

**Knowledge of educational end, purposes and values** has to do with teachers' knowledge about the aims, rationale and goals of education.

Recent research by Davis and Andrzejewski (2009) has shown that teachers' beliefs exist on many levels, from the global to the personal levels. They serve as all-embracing frameworks for understanding and engaging with the world, and also shape teachers' professional practices directly related to their classroom practice. For example, teachers at the global level hold the beliefs about the purpose of schooling rooted in the holistic perspective of education, aimed at helping all learners to reach their full potential in every facet of their lives, whilst other teachers hold beliefs that are rooted in the essentialist model that positions schools as a place where learners acquire knowledge, values and skills critical for becoming productive members of society. In addition, others hold a belief that schooling should help learners become lifelong learners by enhancing their individuality.

As Hofer and Pintrich (1997) pointed out, epistemological belief is shaped by the role of schooling, and teachers' beliefs about learning are influenced by their epistemological beliefs. This relates to how people learn, what it means to have learned, and how they acquired their knowledge. The essentialist teachers are likely to claim that only certain kinds of knowledge are valid and they focus their effort on learners to learn those kinds of knowledge, while the behaviourists are teachers who believe in authoritarian figures, for example that teachers, scientists or doctors are the only real sources of knowledge to be adopted in learning, basing their argument on the notion that teachers know and feed the learners, while learners receive and learn (Hinchey, 1998, as cited in Raymond, 2002).

Furthermore, as opposed to the notion above those teachers who hold a belief that learning is a two-way traffic, value learners as sources of knowledge, skills and learning in their classrooms. They also restructure their classrooms in ways that emphasise learners' contributions to their own learning process. They also tend to believe that both teachers and learners know and learn together and that learning happens through dialogue and shared interaction.

In addition, others believe that Mathematics and Integrated Natural Sciences teachers teach their learners specific contents. In the process of teaching, they also acquire knowledge and skills on how to handle their subjects. Status, stability, sequence, and scope shape these teachers in relation to global and local beliefs (Stodolsky & Grossmon, 1995).

As the teachers acquire more knowledge and skills, their conceptual understanding of the following improve: the way they organise learning and teaching material in order to enhance learners' understanding, anticipation of misconceptions, instructions, assessment decisions and strategies to take full responsibility for their own learning, and become competent, skilful and proficient in their academic work.

The influence of pre-existing knowledge systems in shaping cognitive processing and behaviour is widely recognised in cognitive psychology and education research to focus on learning and development where both teachers and learners construct new knowledge and skills based largely on what they already know (Bransford, Brown, & Cocking, 1999). The newly constructed knowledge and skills are infused into these pre-existing structures when aligned with one another, or substantively altered through the process of accommodation (Piaget, 1977, as cited in Oleson & Hora, 2012). In this way learners assimilate newly constructed knowledge and skills better.

These pre-existing structures eventually shape the perceptions in a variety of ways including which features of a problem to notice and respond to (Bandura, 1977, as cited in Oleson & Hora, 2012). It is through observation of teachers' behaviour in direct experience with the world that learners begin to develop a storehold of knowledge and skills on how to understand and carry out particular tasks in order to perform better in Mathematics and Integrated Natural Sciences. The social learning theory of development emphasises the important role that observation of teachers' behaviour plays in the process of shaping an individual's knowledge, skills, attitudes and actions. However, by simply observing Mathematics and Integrated Natural Sciences teachers does not automatically lead to learned behaviour. For the observation to lead to lasting changes in the individuals' cognitive structures, individuals should have the ability to retain new information and physically reproduce the action, and have the motivation to model the observed behaviour through the coined term of apprenticeship.

### **Research Methodology**

There were 26 participants involved in this research, 11 females and 15 males. Semi-structured interviews and questionnaires were used to gather data. The research instruments sought information based on gender, qualifications, further studies, and teaching experience.

### **Results and Discussion**

The results and findings are discussed and analysed under the headings as indicated at each table.

**Table 1: Responses by Gender**

Gender	Responses	Percentage (%)
Female	11	42.3
Male	15	57.7
<b>Total</b>	<b>26</b>	<b>100</b>

The table shows that the Rundu Campus FoE as training institution for teachers, models gender fair practices so as to develop appropriate gender attitudes in all teachers. In doing so, it is particularly important that females be equally represented among students in teacher education institutions.

**Table 2: Qualifications of respondents**

Qualification	Responses	Percentage
BETD	17	65.4
Advanced Certificate in Education	5	19.2
Advanced Diploma in Education	4	15.4
<b>Total</b>	<b>26</b>	<b>100</b>

All the informants are BETD holders from the former Rundu College of Education (RCE). As shown in table 2, 17 of them did not further their studies after attaining the BETD qualification, while the other 9 furthered their studies and obtained advanced certificates and diplomas in education. Among the 9 that furthered their studies, 8 studied with North West University in South Africa, and one studied at Belvedere teachers college, which is affiliated to the University of Zimbabwe in Harare. Although they all have teaching qualifications, they opted to improve their qualifications in Mathematics and Integrated Natural Sciences in order to be better equipped in their subject matter knowledge, skills and teaching methods. The attainment of the B. Ed. (Hons) degree opens up avenues for them to study at masters and doctoral levels. This also serves as motivation to those with similar qualifications to further their studies.

**Table 3: Teaching experience**

Years of teaching	Responses	Percentage (%)
0 - 3	2	7.7
3 – 6	8	30.8
6 – 9	9	34.6
9 – 12	7	26.9
<b>Total</b>	<b>26</b>	<b>100</b>

Teaching experience matters, particularly during the first 5 years of teaching. However, more experience may be of greater importance for high school teachers than for teachers in lower grades. During the first

5 years, teachers appear to gain in effectiveness, which contributes to learners' achievement scores. Beyond the fifth year, they level off and contribute little or none in terms of learners' achievement. This concurs with the findings in Table 3, where 24 out of 26 teachers have more than 5 years of teaching experience. This implies that these teachers had to further their studies, and that seems to be the reason why they opted to study B. Ed (Hons) at the Rundu Campus of the University of Namibia. Experience still plays an important role, as experienced teachers contribute to their schools in other important ways, such as providing stability, serving as mentors to new or struggling teachers, as well as learners and the community at large.

Other factors that emerged from the informants in this research paper on why they chose to study at the Rundu Campus, are discussed below.

### **Distance**

The University of Namibia, Rundu Campus, is situated in the Kavango East. The campus now has fully-fledged university status, offering accredited undergraduate programs at two of its faculties, namely, the Faculty of Education (FoE) and the Faculty of Economics and Management Sciences (FEMS). It now accommodates 2 140 students: 1 594 full-time, 317 CoDel, and 175 INSET (Diploma in Junior Primary Education) (DJPE). The Rundu campus is not far from Rundu Town Central Business District (CBD) and it only takes 10 minutes by car from the campus to the CBD. The fully-fledged university status accorded to the UNAM Rundu campus gave opportunities to the participants to study closer to their homes and work stations. This is an advantage as students do not have to travel more than 700 km to the Windhoek Campus, as it was before the merger. Earlier only the Windhoek UNAM campus offered degrees at under-graduate, post-graduate and doctoral levels.

### **Financial Assistance**

This research found that financial assistance is granted automatically by the Namibia Student Financial Assistance Fund (NSFAF) in the form of a loan, with the aim of covering tuition, registration fees, accommodation and meals. The financial assistance is only granted to under-graduate studies and not post-graduate studies. However, it came to light that some participants got the NSFAF loan, while others did not because they assumed that loans were automatically and there was no need to apply for it. It also emerged that these participants were on study leave with full salaries for the duration of course. The analysis shows that those participants benefited from the NSFAF loan twice since they were still on full salaries. It would have been fair if, in their first year, they got 100% of their salaries, in the second year 75%, in the third year 50%, and in their final year 25%. In the event of failure in the fourth year, the participants need to register for the failed modules, but will have go back to their work stations and make arrangements to attend lectures or, alternatively, continue on distance mode.



## Conclusions and Recommendations

In conclusion, this research paper reveals the reasons why the participants in this study opted to further their studies at the Rundu Campus of the University of Namibia. The major reasons were to attain higher level subject contents, skills, and teaching methods in order to become better classroom practitioners. In addition, teachers with degrees in Mathematics and Integrated Natural Sciences appear to be strongly and consistently related to learners' achievement scores. Therefore, this research paper recommends that all BETD graduates who have not yet furthered their studies in Mathematics and Integrated Natural Sciences be strongly advised to improve their qualifications by attaining a B. Ed. (Hons) degree so that the quality of education in Namibia can improve. This will result in a highly educated nation that can compete within the SADC region and at international levels. We recommend that UNAM roll out an INSET Diploma program for BETD Mathematics and Integrated Natural Sciences holders who failed to upgrade their qualifications. This program should be tailored for UP and JS levels for a period of 4 years during school holidays.

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