INFLUENCE OF PARENTAL EDUCATION AND INCOME LEVEL ON STUDENTS’ PERFORMANCE IN SENIOR SECONDARY SCHOOL MATHEMATICS IN BOTSWANA

*S.P. Baliyan
*K.S.Madhava Rao
*P.S. Baliyan

ABSTRACT

This quantitative study aimed to determine the influence of parental education and income level on the performance of senior secondary students in Mathematics in Botswana. A survey method was adopted to collect data from a random sample of 168 students doing mathematics. The data were collected on the three measures of socio-economic status; family income, father's education, and mother's education. The level of father’s education was found to be higher than the mother’s as no father was found to be illiterate but 7.7% mothers were found to be illiterate. The highest of 51.2% students belong to low income level whereas a lowest of 8.3% to the high income level families. The income level, mother’s education level and father’s education level have significant influence on the performance of students in maths which indicates that these factors are significant predictors of the performance of students in mathematics. Government as well as parents should find effective strategies to improve their education and income.

*S.P. Baliyan (Corresponding author). M.Ed. (Research and Evaluation) Student, Department Educational Foundations, University of Botswana E-mail: spbaliyan@yahoo.com
*K.S.Madhava Rao, Professor, Department of Statistics, University of Botswana, E-Mail: raom@mopipi.ub.bw
*P.S. Baliyan, Lecturer, Department of Accounting and Finance, University of Botswana, E-mail: Baliyanp@mopipi.ub.bw
so as to be able not only in providing the necessary reading material and learning environment to their children but also equip parents in helping, encourage and motivate in learning mathematics. The socio-economic status of the students, especially in rural areas can be improved by offering some monetary incentives such as rural scholarships.

**Keywords:** Performance, Academic Achievement, Mathematics education, Income level, Socio-economic status

**INTRODUCTION**

Education is seen as an utmost important instrument of socio-economic change around the globe and is therefore being utilized to re-orientate the society. In broader sense, education is the aggregate of all the processes by means of which an individual develops abilities, attitudes and other forms of behaviour of positive value in the society in which he lives (Fafunwa, 1984). The First National Policy on Education in Botswana was formed in 1977 and revised in 1994 and Mathematical education is emphasised at all the levels of education namely the primary, secondary and tertiary levels. Mathematics is a subject where by knowledge on the numbers is obtained in order to enhance the numerical ability. It is a subject that is related to other school subjects and encompasses topics like number and numeration, variation, graphs, fractions, logarithms and indices, algebraic processes, solution of equation and also in area and volume.

Mathematical education is considered one of the most important segments of the education sphere as it is an integral part of each and every step in the human life whether it is student life or professional or business life. Mathematics as a subject affects all aspects of human life at various levels. The personal, social,
economic, political, geographical, scientific and technological aspects of social life all are centred on numbers. The basic skills underlying all scientific, economics and technological skills are the control of the tools of numbers and therefore mathematics is seen as the language used to describe the problems arising in most branches of science and technology. However, the poor performance in maths has been a concern among the students, teachers, parents, policy makers and other stakeholders. Performance refers to the ability of grasping the contents of the subject and is reflected in term of percentage of marks obtained through properly implemented tests. Awokoya (1975), Fafunwa (1980), both agreed in different researches that we live in a world where science and technology have become an integral part of the world culture, therefore for any nation to be relevant; it must not over look the importance of mathematics in her educational system. Accordingly, the observed poor performance in mathematics has been a matter of serious concern to all well-meaning educators. Students’ poor performance in mathematics over the years has been attributed to the fact that the subject is difficult. Observing the International General Cambridge Secondary Examination (IGCSE) and the Botswana General Certificate Secondary Examination (BGCSE) results over the years, it has been realised that the students are not performing well in mathematics as compared to the other subjects (Botswana Education Council, 2009). The students always feel uncomfortable to do mathematical subjects which bring a factor of a fear among the Batswana students. The students do not show much interest in doing mathematics which results in poor performance. The investigations of the factors influencing the academic achievement of students in mathematics have attracted the interest and concern of teachers, psychologists, researchers,
parents and school administrators and policy makers. Some of the factors identified are low socio-economic status of the family, students' attitude, poor family structure, poor study habit, parents' education, income and occupation (Sogbetan, 1981; Hassan, 1983; Maple and Stage, 1991; Steinberg, 1993; Brooks-Gunn and Chase-Lansdale, 2001). Ajila and Olutola (2000) categorise problems responsible for students' poor performance as their environment, which include availability of suitable learning environment, adequacy of educational infrastructure like textbooks and society at large among others.

Although socio-economic status (SES) has been at the core of a very active field of research, there seems to be an ongoing dispute about its conceptual meaning and empirical measurement in studies conducted (Bornstein & Bradley, 2003). As White pointed out in 1982, SES is assessed by a variety of different combinations of variables, which has created an ambiguity in interpreting research findings. Many researchers use SES and social class interchangeably, without any rationale or clarification, to refer to social and economic characteristics of students (Ensminger & Fothergill, 2003). In general terms, however, SES describes an individual’s or a family’s ranking on a hierarchy according to access to or control over some combination of valued commodities such as wealth, power, and social status (Mueller & Parcel, 1981). While there is disagreement about the conceptual meaning of SES, there seems to be an agreement on Duncan, Featherman, and Duncan’s (1972) definition of the tripartite nature of SES that incorporates parental income, parental education, and parental occupation as the three main indicators of SES (Gottfried, 1985; Hauser, 1994; Mueller & Parcel, 1981). Parental income as an indicator of SES reflects the potential for social and economic resources that are available to
the student. The second traditional SES component, parental education, is considered one of the most stable aspects of SES because it is typically established at an early age and tends to remain the same over time. Moreover, parental education is an indicator of parent’s income because income and education are highly correlated (Hauser & Warren, 1997). The third traditional SES component, occupation, is ranked on the basis of the education and income required to have a particular occupation (Hauser, 1994). Socio-economic status like parents' education, occupation, income and standard of living have shown to be related to students' outcomes, such that students from middle to upper class families tend to outperform those from less advantaged background (Jaffe, 1985; Rani, 1998; Simon, 2004). The educational and income are the two important components of socio-economic status of the society and this study would only be restricted to the variables parents' education and income level as the factors affecting the academic achievement of students in Mathematics. Therefore, this study was an attempt to determine the influence of the parental education and income on the performance of students in mathematics. The specific objectives of this study were:

1. To describe the demographic characteristics of the respondents, in term of gender, parental education and income level.
2. To determine if the parental education level has any influence on the performance of students in mathematics.
3. To determine if the parental income level has any influence on the performance of students in mathematics.

**REVIEW OF RELATED LITERATURE**

There is evidence that parents' education will affect students' academic achievement in Mathematics. According to Grissmer (2003), parents' level of education is the most important factor
affecting students' academic achievement. Taiwo (1993) submits that parents' educational background influence the academic achievement of students. Musgrave (2000) states that a child that comes from an educated home would like to follow the steps of his/her family and by this, work actively in his/her studies. Onocha (1985) concludes that a child from a well educated family with high socio-economic status is more likely to perform better than a child from an illiterate family. Similar results were found by Teese (2004), in his analysis of the students' performance where he found clear and consistent trends for children from lower socio-economic background of performing poor as compared to the students from high socio-economic status. Coleman (1998) state that the relationship between socio-economic status and learning outcomes has been widely accepted almost as an article of faith by educators. This was supported by the Children's Defence Fund (1995) "Year Book" on the State of America's children which indicated that the economic factor which refers to family characteristic is the most powerful predictor of school performance. Careful consideration of the socio-economic status of parents reveals that the higher the standard of living (higher income) of the parents, the higher the academic performance of the child and vise-versa.

According to Marjoribanks (2003), the high achievers had a high socio-economic status and they hailed from highly educated families. Lockheed, Fuller and Nyirongo (1989) show that students belonging to upper socio-economic status groups showed better academic achievement than students belonging to lower socio-economic status groups. With reference to achievement in Mathematics, Howley (1989) and House (2002) stated that students learn better if they are from above average or average income family, with well-educated parents who
participate in the school's education process and encourage their children to learn. They established that the socio-economic status of students affected their achievement positively.

Family background is key to a student’s life and out of school, is the most important influence on students learning and, includes factors such as socio-economic status, parenting practices, maternal characters, family size (Majoribanks, 1996). The socio-economic status of a child most determined by combining parents educational level, occupational status and income level (Jeynes, 2002). Students have repeatedly found that socio-economic status affects students performance (Baharudin and Luster 1998, Jeynes, 2002, Eamon 2005, Majoribanks 1996, Hochschild, 2003, McNeal 2001, Seyfried 1998). Higher income has linked with higher academic achievement. Students with high income are likely to receive more parental attention and have more access to resources those children from low income families. The addiditional attention and support leads to better performance (Eamon 2005, Majoribanks 1996). Wright, R.J. and Bean, A.G. (2005) studied the influence of socio-economic status (SES) on the predictability of college performance on each of three measures: (a) family income, (b) father's occupation, and (c) mother's education. They found out that socio-economic status has positive relationship with the performance of students.

Students who have low socio-economic status earned lower test scores (Eamon 2005, Hochschild 2003). The marks of low socio-economic students have found about ten percent lower than higher socio-economic status students (Seyfried 1998). It is believed that low socio-economic status negatively affect academic achievement because socio-economic status access to vital resources and creates additional stress at home (Eamon 2005, Majoribanks 1996, Jeynes 2002). The economic hardship
that are caused by the low socio-economic status leads to disruption in parenting, an increasing amount of family conflicts, and an increased likelihood of depression in parents (Eamon 2005). For these reasons socio-economic status is closely tied to home environment which leads to quality of life and fully negative effect on the performance.

Maternal characters are the other key factors that affect academic performance. Mothers who are more educated have children who receive higher test scores (Baharudin and Luster 1998, Eamon 2005, Majorbribank 1996). Muhammad Saeed, Muhammad Bashir Gondal, Bushra, (2005) found factors affecting students achievement were parental education, their occupation and guidance, social status, transport facility, self study, book reading and home work. All these factors have a positive or negative correlation with students’ achievement. There was positive correlation between the level of parental education and the performance of students. Researchers have indicated that family's socio-economic status is based on parents' income, education and occupation. Thus, a family with high socio-economic status is often more successful in preparing its young children for school because they typically have access to a wide range of resources to promote and support their development. They are able to provide their young children with high quality child care, books and teaching facilities such as compueters, to encourage them in various learning activities at home. This in turn, will affect the students' academic achievement in mathematics.

Pupils with families where parents have less education tend to systematically perform worse than pupils whose parents have more education. According to Nannyonjo (2007) pupils with parents who did not finish primary or just finished primary, and
pupils with parents who finished senior school or university performed considerably better. The highest increase in test scores was for pupils whose fathers had a university degree. These results possibly reflect the ability of parents to support the pupils’ school work, and likely interactions of literate parents with their children in school related or literacy nurturing activities as well as their ability to support their children with home work or help with difficult home work questions. Similarly Okumu et al. (2008) found that high academic attainment of a mother and father not only significantly reduces chances of primary school dropout but also improve the performance. For a mother, this phenomenon could be attributed to the fact that educated mothers reduce the time spend doing household chores while increasing the time spend with their children than their uneducated counterparts. Also educated mothers are more effective in helping their children in academic work. In doing so, they are also able to monitor and supervise their children’s academic progress. While for fathers it’s attributed to the fact that educated fathers are also interested in their children thus they would be willing to spend more time in helping their children in academic problems. Alisa (2010) found that the gap in attainment between children from the poorest and richest backgrounds grew particularly fast during the primary school years. By age eleven, only around three-quarters of children from the poorest fifth of families reached the expected level at Key Stage 2, compared with 97 per cent of children from the richest fifth. Poorer children who performed well in Key Stage tests at age seven were more likely than better-off children to fall behind by age eleven, and poorer children who performed badly at age seven were less likely to improve their ranking compared with children from better-off backgrounds – an important factor behind the widening gap.
Akanle, (2007) identified Parental income in his work to be a cogent factor upon which the academic/vocational successes of secondary school students life. He found parental income not to be sufficient to sustain the academic and personal social life of the student in sub rural school areas. This to a large extent affects the psychological balance or homeostatic balance in the class room, which causes low concentration, low perception, frustration, sickness and emotional disability in academic performance of the students. Therefore when a child is deprived of the essential needs he may be found to perform poorly in his school work. Keeves and Saha (1992) found that in most countries of the world, educational achievements are related to the social background of the students. Study carried out by Mok and Flynn (2008) to examine the achievement of students showed that parent’s level of education made a significant contribution to achievement. High socio-economic status students scored better in the high school certificate than the medium or low socio-economic status students. White (1982) found a high correlation ($r = 0.875$) between socio-economic status and achievement. Beaton et all (1996) reported that the more education resources in home have the higher the student achievement than those who reportedly have little access to such resources. The strong relationship was found between mathematics achievement and having study aids in the home which are also positively related to the parental education and income levels. Fraser (1994) found that two variables with the highest correlated with educational achievement are encouragement and parental education. In a home where parents are fairly or highly educated, there is a tendency that they would aspire to see their children better than they are educationally. This inspiration will force them to motivate their children by providing for their basic needs in
education hence their performance in their academic work in school will improve. It also explains why children from high socio-economic status performed better than those from the middle and low socio-economic status. According to Ogwn (2004), the high socio-economic status parents are able to provide their children with high quality books and other educational material to encourage them in their various learning activities at home. Olubadewo and Ogwu (2006) revealed that the parents’ socio-economic status greatly influenced the academic performance of their children in English and mathematics.

To conclude this review, there is a huge complexity of reasons why students from low socio-economic status are less likely to excel in education. These range from family and community expectations due to possible returns of education for the family, financial hardship, parents ambivalent attitudes to education, poor attendance patterns due to need for child labour. Likewise there are also many reasons why pupils from high socio-economic status excel in education. These include ability of literate parents to support pupils with home and school work, monitoring and supervision of children’s school work and access to information and social networks necessary for their children’s success in life.

**Research questions**

The objectives of the study have been translated into the following questions:

**Research question 1:** *Does the income level has any influence on the performance of students in maths?*

**Research question 2:** *Does the mothers’ education level has any influence on the performance of students in maths?*
Research question 3: Does the father’s education level have any influence on the performance of students in maths?

Research Hypotheses
To answer the above listed research questions, the possible hypothesis in the alternate form can be stated as below.

H₁₁: The income level has significant influence on the performance in maths
H₁₂: The mother education level has significant influence on the performance in maths
H₁₃: The father’s education level has significant influence on the performance in maths

METHODOLOGY
The proposed study was a quantitative research. A positivism paradigm has been considered. It is the best suited to the quantitative research orientation because researchers in this study were interested in quantifying the data, the outcomes of positivism are exploratory in the way things really are and facts are discovered. The research design of the study is based on the model in which the socio-economic variables (parental education and income level) are independent variables or predictors, and the performance of students in mathematics (marks in mathematics examination) as the dependent variable. A survey design was employed to collect the relevant data. The survey is the best method to explore the facts as the study was to explore the performance of students in maths because survey entails the hidden truth and facts about any social aspects and the independent variable are the social aspects in this study. Three of the Private Senior Secondary Schools in Botswana were selected through a random sampling method. A total of 168 students doing mathematics in form 5 were selected for data collection. Data on the independent variables were collected through a pre-tested
structured questionnaire. Data on the dependent variable were collected from the records available with the administration of the selected schools. The data collected were entered in the SPSS analyser Ver.19 for purpose of analysis whereby Analysis of Variance was used.

RESULTS AND DISCUSSION

Descriptive Statistics of Sampled Respondents
There were 168 students enrolled for Mathematics comprised of 80 male and 88 female students which contributed to 47.6% and 52.4% respectively to the student’s population under study. The lowest minimum of 6% and highest maximum of 96% marks are obtained in mathematics however, mean marks were found to be 54.65%. The highest number of sampled students (81) were staying in the urban area whereas the lowest of 39 stay in the rural area. Reflecting that the students coming from the rural area are only 23.21% because the school is located in the towns/cities and it is difficult for the students to transport to and fro every day. The fathers were found to be highly qualified than the mothers as only 28% mother have obtained university education whereas the percentage of fathers who obtained university education was 51.25. Only 3% of fathers are educated up to basic education as compare to 20.2% mothers who are educated up to basic education level. None of the father was illiterate but 7.7% mothers were illiterate. Conclusively, it can be said that mothers are still far behind than the fathers as far as parental education level is concerned and it may have influence on the performance of their children. On the income of the parents of the students, the highest of 86 (51.2%) students belongs to the low income families whereas a lowest of 14 (8.3%) students were from the high income families. The higher percentage students were from the
low income families which may have contributed to the poor performance in mathematics.

**Testing of the formulated hypotheses**

In order to answer the formulated research questions, the stated hypothesis were statistically analysed using One Way Analysis of Variance.

The hypotheses in their null form are:

- $H_{01}$: The family income level has no significant influence on the performance in maths
- $H_{02}$: The mother education level has no significant influence on the performance in maths
- $H_{03}$: The father’s education level has no significant influence on the performance in maths

**Table 1: Influence of family income on the performance**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>8736.30</td>
<td>2</td>
<td>4368.150</td>
<td>13.397</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>53797.67</td>
<td>165</td>
<td>326.047</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>62533.97</td>
<td>167</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the results in Table 1, the null hypothesis is rejected because observed $F (= 13.40)$ exceeds critical value $F_0 (= .000)$. Also, the observed p-value (which is close to .000) is less than $\alpha = 0.05$. Therefore, it indicates that the income level has significant influence on the performance in mathematics. The result indicated that students who belong to high income level had a better performance in Mathematics than their counterparts whose parents belong to the medium and low income level families. The
findings are supported by that results found by Jaffe (1985), Rain (1998), Simon (2004), Teese (2004), Sharma (2004), Dubey (1999) and Crane (1993). This is because parents' education has highest effect or predicts students' academic achievement in Mathematics most. The parents with high income might have enough money which can be used to provide the needed materials and support for their children in order to arouse their interest in Mathematics than their counterparts in low income families whose major obligation is to provide shelter and food for the family. These phenomena could be justified by the fact that students of high socio-economic parents enjoy such motivational intervention as extra home coaching, enriched home environment with tutorial disks and programmes available in video, good library and better state of mental health. On the other hand, the students of low socio-economic parents are less fortunate and are highly stressed and exploited at home through engagements in domestic tasks leaving little time for studies which contributes to poor performance.

**Research question 2**: Does the mothers’ education level has any influence on the performance of students in maths?

**H02**: The mother education level has no significant influence on the performance in maths

**Table 2: Influence of mothers’ education level on the performance**

Dependent Variable: Maths Exam Marks.

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>8716.070</td>
<td>3</td>
<td>2905.357</td>
<td>8.854</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>53817.906</td>
<td>164</td>
<td>328.158</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>62533.976</td>
<td>167</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Decision: Reject $H_{02}$ because observed $F (= 8.85)$ exceeds critical value corresponding to the p-value (.000). Also, the observed p-value (.000) is far less than $\alpha = 0.05$. Therefore, the mothers’ education level has significant influence on the performance in maths.

Research question 3: Does the father’s education level has any influence on the performance of students in maths?

$H_{03}$: The father’s education level has no significant influence on the performance in maths

Table 3: Influence of fathers’ education level on the performance

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>12719.318</td>
<td>2</td>
<td>6359.659</td>
<td>21.065</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>49814.658</td>
<td>165</td>
<td>301.907</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>62533.976</td>
<td>167</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

The results in Table 3 support to reject the null hypothesis because observed $F (= 21.06)$ exceeds critical value corresponding to the p-value (.000). Also, the observed p-value (which is close to .000) is less than $\alpha = 0.05$. Therefore, the father’s education level significant influence on the performance in maths.

The results on father and mothers education reveal that parents' education has significant influence on the academic achievement of students in Mathematics. This observation provides the evidence that students of educated parents performed better than students of uneducated parents in Mathematics achievement. The findings support the results of Onocha (1985), Carlson (1997), Musgrave (2000) and Grissmer (2003) which reported that parents' level of education was the most important
factor affecting students' academic achievement. The results are supported by the study conducted by Howley (1989) and House (2002) on achievement in Mathematics, stated that students learn better if they are from above average or average income family, with well-educated parents who participate in the school's education process and encourage their children to learn. In a family where parents are fairly or highly educated, there is a tendency that they would aspire to see their children better than they are educationally. This inspiration will force them to motivate their children by providing for their basic needs in education hence their performance in their academic work in school will improve. High socio-economic status parents are able to provide their children with high quality books and other educational material to encourage them in their various learning activities at home which also explains why children from high socio-economic status performed better than those from the middle and low socio-economic status.

**CONCLUSION**

The findings of the study unveiled the factors affecting the students’ performance in Mathematics. The level of father’s education was found to be higher than the mother’s as none of the father was illiterate but 7.7% mother was recorded as illiterate. The highest of 51.2% students belongs to low socio-economic status whereas a lowest of 8.3% to the high socio-economic status families. The family income level, mother’s education level and father’s education level have significant influence on the performance of students in maths. The parents with high income might have enough money which can be used to provide the needed materials and support for their children in order to arouse their interest in Mathematics than their counterparts in low income families whose major obligation is to provide shelter and
food for the family. A family with high socio-economic status is often more successful in preparing its young children for school because they typically have access to a wide range of resources to promote and support their development. They are able to provide their young children with high quality child care, books and teaching facilities such as computers, to encourage them in various learning activities at home. Educated parents are as well aware of the possible returns to their children and they are more likely to have access to information and social networks necessary for their children to engage into relatively human capital intensive activities yielding high returns to education. The well educated parents increasing the time spend with their children than their uneducated counterparts and they are more effective in helping their children in academic work. This all in turn, affect the students' academic performance in Mathematics.

**RECOMMENDATIONS**

From the findings of this study, the following recommendations can be made:

i. Since parents’ education influences students academic achievement in Mathematics, the government and all stakeholders in education sector should endeavour to implement its policy on the uplifting of education for all and thus create an enlighten society in which every parent would be educated enough to have a positive influence on their children especially in Mathematics by helping their children in completing their home work which will ultimately encourage and motivate in learning mathematics. Effective implementation of distance and adult education programs can be very effective in improving the education levels of parents.

ii. Parents should also try to improve their income so as to be able not only in providing the necessary reading material and learning
environment to their children. It is suggested that Government can offer some incentives such as rural scholarship to the students, especially staying in rural areas so as to uplift their income level status.

iii. Given that the present study is limited to the influence of parental education and income only, studies could be carried out in the country by including other factors influencing performance in mathematics such as gender, location of residence, teachers’ attitudes, teacher’s qualification, influence of friends.

**Biographical note of author:** The main author was born on January 1, 1968 in India. He holds Master of Science in Agriculture (Agricultural Economics), Bachelor of Science in Agriculture Honours and Bachelor of Education degrees with 16 years of international experience in research and teaching. At present, he is serving Livingstone Kolobeng College, Gaborone, Botswana as an agriculture teacher and also, reading for his second master degree (Master of Education in Research and Evaluation) at University of Botswana. He has published eight research papers and two books. He has served the Ministry of Education and Ministry of Agriculture in the Republic of Botswana (Southern Africa) and in India in the field of research and teaching. He is accredited by University of Cambridge International Examinations for Training in school based assessment in IGCSE Agriculture, with Botswana Training Authority (BOTA) as a Trainer; accredited with the South African Qualification Authority (SAQA); accredited by Local Enterprise Authority (LEA) in Botswana as a Consultant, Mentor and Trainer.

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