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# LEARNERS' PERCEPTIONS ON FACTORS THAT AFFECT THEIR OVERALL PERFORMANCES IN MATHEMATICS

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## Abstract

*This paper presents part of the main study that was aimed at determining the effect of factors that affect learners' poor performances in mathematics in rural areas of Limpopo Province in South Africa. This cross-sectional and quantitative study, which was aimed to exploring learners' perceptions about factors that affect their performances in mathematics, used secondary data consisting of 113 randomly sampled participants, 38(33.63%) male and 75(66.37%) female learners, from Sekgosese cluster in the Limpopo Province. The questionnaire use for data collection was found to be reliable at Cronbach's α =0.7002. Pearson's chi-square test results, interpreted at 0.05 error rate, revealed that male and female learners had similar perceptions about socioeconomic status (p=0.502), parental involvement (p=0.142), learner's age (p=0.295), leaner's gender (p = 0.816), absenteeism (p=0.484), learner attitude (p=0.208), punctuality (p=0.693), substance abuse (p=0.485), command of English language (p=0.457), overcrowding (p=0.182) and school quintile (p=0.749), as factors that affect learners' poor performances in mathematics. Significant association was observed between participants' gender and parents' education (p=0.026); wherein most female participants than male participants disagreed with the fact that parents' education is a significant contributor towards learners' poor performances in mathematics (n=38;55.07% versus n=16; 44.44%). The study results have implications for education authorities' strategic efforts to adjust for factors that, according to the learners, are important when intervening in the learning and teaching of mathematics.*

***Keywords:*** *Learner performance, learners' perceptions, mathematics learning, school quintile, parents' educational status*

## Introduction

Stereotyping researchers have found that priming a social category can automatically elicit stereotype-consistent behaviours, and the behaviours include decreased intellectual performance (Steele & Ambady, 2006). Ashmore and Del Boca (2015) indicates that stereotype refers to the fixity of behaviour, both topographically (i.e., unchanging mode of expression") and temporally (i.e., "persistent repetitiveness"). Psychiatrists use the related term *stereotypy* to denote a pathological condition characterised by behaviour of persistent repetitiveness and unchanging mode of expression (Ashmore & Dell Boca, 2015). For example, Steele and Andy (2006) found that women who were subtly reminded of the category female or their gender identity expressed more stereotype consistent attitudes

towards the academic domains of mathematics and the arts than participants in control conditions. In South Africa, some strata or sections of the population were made to believe that mathematics is not only hard but difficult. This found the expression in Sepedi, a popular language in the Limpopo Province, which goes "*Dipalo ntshetshere!"* which may be translated into *"mathematics is the most difficult subject ever!"* Similar expressions are found in IsiXhosa, a local language in the Eastern Cape Province, that "*Izibalo kuyafiwa kuzo!*" or "*Izibalo, azikho lula, konyuka umngantsa"* and in IsiZulu, a common language in KwaZulu-Natal Province, that goes "*Izibalo zilukhuni*" which may be translated into *mathematics will kill you or there is nothing easy in mathematics; it is really heavy – it is more like climbing (the biggest mountain).* These forms of follies, fallacies (Letsoalo, Maoto, Masha, & Lesaoana, 2016) or contemporary legends, in their extreme cases may constitute mathephobia, deserve special attention.

Adequate skills and knowledge of mathematics are believed to be a vital component of successful contemporary life and socioeconomic. In other words, it is widely acknowledged that mathematics is vital to our everyday lives. Knowledge of mathematics is essential for all members of the society (Reyes & Stanic, 1988). Therefore, mathematical proficiency is increasingly recognised as fundamental to economic success for individuals and for nations. The importance of mathematics extends to the support and contribution to the purposes of general education (Breslich, 1966). The significance of mathematics is understood not to mean the baser material advantage to the individual learner (or student), not at all a narrow utilitarianism, but rather a comprehensive grasp of the usefulness of mathematics to society as a whole, to statistics, to business, to science, to engineering, to the nation (Hedrick, 1917).

Measuring learners' academic performances is challenging since their (learners') performances are products of socioeconomic, psychological and environmental factors (Hijazi & Naqvi, 2006). Many studies have been conducted on factors that affect learners' performances e.g., Kyei and Nemaorani (2014), Letsoalo et al., (2016) and Letsoalo, Maoto, Masha and Lesaoana (2017). This study focused on the perceptions of learners about factors that affect their mathematics performances. This paper was designed to explore the perceptions of leaners on learners' poor performances in mathematics. The study was based on the perception of learners from rural area of Limpopo Province of South Africa. The participants were randomly sampled from Sekgosese Cluster, comprising Central and West circuits, of the Limpopo Province.

In South African context, a learner from a rural area essentially has financially disadvantaged backgrounds and as such is at risk of not completing his or her studies, especially post matriculation. The researcher expect that this study will be useful for secondary school educators and education authorities as it will suggest some remedial measures for the effective and better academic performance of secondary school learners, especially in mathematics.

## Literature review

Learners' academic performance and achievement occupies a very important place in education as well as in the learning process (Mendezabal, 2013; Sikhwari, 2016). Many studies on factors that affect students' performances have been conducted, e.g. Battle and Michael (2002), Adediwura and Tayo (2007) and Ready (2010); and their reviews support the hypothesis that learner performance is associated with different socioeconomic, psychological and environmental factors.

Different scholars have defined socioeconomic status (SES) in different ways. The gist of all definitions encompass that SES is the combination of economic and sociological measures of an individual work experience and the economic and social position of an individual or family in relation to others on the basis of income, educational level and occupational status (Letsoalo et al., 2017). Socioeconomic status is generally divided into three categories i.e., high socioeconomic status, middle socioeconomic status and low socioeconomic to explain the three fields a family or an individual may fall into. When putting a family or individual into one of these categories, any or all of the three variables i.e., income, education, and occupation can be reviewed and assessed.

A person's education is closely linked to their life chances, income, and well-being (Battle & Michael, 2002). Therefore, it is important to have a clear understanding of what benefits or hinders one's educational attainment. Countless factors have been analysed by educational researchers to explain why some learners perform better on standardised tests or attain higher levels of academic achievement than other learners. Resulting in data been gathered from myriad sources and analysed by many researchers to confirm or refute a relationship between learners' socioeconomic standing and their subsequent academic achievement.

According to the International Council of Nurses (2004), poverty is a human condition, a way of life that affects all interactions a person has with the world. Studies have repeatedly shown that socioeconomic factors have a large, pervasive and persistent influence over school achievement (Ferguson, Bovaird, & Mueller, 2007). Phipps and Lethbridge (2007) examined the correlation between income and learner outcomes in learners 4 years to 15 years of age and found that higher incomes were consistently associated with better outcomes for learners. In particular, the largest effects were for cognitive and school measures (teacher-administered mathematics and reading scores), followed by behavioural and health measures, and then social and emotional measures, which had the smallest associations. While there is disagreement over how best to measure SES, most studies indicate that learners from low SES families do not perform as well as they potentially could at school compared to learners from high SES families (Graetz, 1995; Phipps & Lethbridge, 2007). As outlined by Considine and Zappala (2002), learners from low SES families have lower higher education participation; lower retention rates or leave school systems early, have less successful school-to-labour market transition, more likely to display negative attitudes to school. Socioeconomic status may also be linked to family structure. As sole parent families, generally, have lower levels of income, are headed by

parents with lower educational attainment and are less likely to be in the labour force, learners from these families are likely to have lower educational performance (Graetz, 1995; Rich, 2000).

Educational performance at school has also been found to vary according to the gender of a learner (Horne, 2000). Disparities between boys and girls in academic performances, especially reading and mathematics achievement, have been a concern among educators for several decades (Letsoalo et al., 2016). In particular, reviews of the evidence suggest that boys suffer an educational disadvantage relative to girls, especially in terms of performance in literacy (Buckingham, 1999). There are several explanations for this increasing gender gap which include: biological differences; gender biases (such as reading being seen as "not masculine"); teaching, curricula and assessment (for instance less structured approaches to teaching grammar may have weakened boys' literacy performance); and socioeconomic factors (Buckingham, 1999).

Swanepoel, Erasmus and Schenk (2008, p. 19) states that an attitude is a degree of positive or negative feeling a person has towards a particular object, such as place, thing, situation or other person. This study focused on the attitude of learners towards (learning) mathematics. There are several factors that determine learners' attitude towards mathematics. These factors can be categorised into three distinctive groups, namely; factors associated with the learners themselves, factors that are associated with the school (learning environment), educator and teaching and the factors from the home environment and society (Swanepoel, Erasmus, & Schenk, 2008). Among others, Zakaria, Chin and Daud (2010) showed that cooperative learning methods improved learners' achievement in mathematics and attitude towards mathematics. Attitudes towards mathematics and its teaching are important contributors to an educator's make-up and approach, because of the effect they can have on learners' attitudes towards mathematics and its learning (Aiken, 1970). In other words, there is a significant positive relationship between learners' attitudes to mathematics and their learning styles (Sirmaci, 2010).

Demographic variables, such as age and gender, are thought to be having some effect on learner achievement. Studies have shown that as a learner gets older, the correlation between age and school achievement diminishes (Jabor, Machtmes, Kungu, Buntat, & Safarin, 2011). The school provides an equalising experience because the longer a learner stays in the school process, the more the effect of age on learner achievement is diminished (Jabor, Machtmes, Kungu, Buntat, & Safarin, 2011). This implies that the act of delaying school entry with the purpose of giving certain advantages to some learners is an exercise in self-deception and it should be discouraged; for it could be a futile effort. Okoro, Ekamen and Udoh (2012) highlighted that many studies have been conducted to investigate the effect of gender on learner performance. Among others, Okoro et al. (2012) and Letsoalo et al. (2017) found that gender of a learner plays a significant part in learner performance. Awodun, Oni and Oyeniyi (2015) lamented that a phenomenon in the school system that has been rather disturbing is the fact that despite the clamour for gender equality treatment, boys and girls do not seem to exhibit the same level of academic

achievement. Depending on learning area for example, the overall science performance favours males (Jovanovic & King, 1998; Hedges & Newell, 1999; Demirbas & Demirkan, 2007; Nuzhat, Salem, Hamdan, & Ashour, 2013).

The consensus amongst South African studies is that the availability or scarcity of key school resources impacts educational outcomes, with higher levels of resources being linked to better educational outcomes (Visser & Juan, 2015). Learners in different classes and different schools do not have equal opportunities to learn. Some learners may have unqualified educators, be in a school with limited resources, or possibly in poorly managed schools. These factors may contribute towards poor academic performance by learners (Stols, 2013). All South African public ordinary schools are categorised into five groups, called quintiles, largely for purposes of the allocation of financial resources. There are two steps in the classification of schools. First, a national poverty table, prepared by the Treasury, determines the poverty ranking of areas based on data from the national census including income levels, dependency ratios and literacy rates in the area. Provinces then rank schools from quintiles 1 to 5, according to the catchment area of the school. Poverty rankings are determined nationally according to the poverty of the community around the school, as well as, certain infrastructural factors. Schools in quintile 1,2 and 3 have been declared no-fee schools, while schools in quintiles 4 and 5 are fee-paying schools. The idea of free schooling is primarily about removing the financial barriers to education. Each national quintile contains 20% of all learners, with quintile 1 representing the poorest 20% and quintile 5 the wealthiest 20%. However, provincial inequalities mean that these quintiles are unevenly distributed across provinces. The quintile ranking of a school is important because it determines the no-fee status of the school. The quintile category of a school is a variable that is under the control of policy makers to alleviate the poverty status in schools, and therefore is a proxy for socioeconomic status or community characteristics. The policy context of this variable is viewed as the amount of money given to schools per learner, provision of nutrition programmes and non-payment of fees by parents.

Individuals' choices concerning health-related behaviour have both direct and indirect effects on several dimensions of their lives. In particular, abusive consumption of addictive substances, such as alcohol and drugs, is positively associated with the probability of undertaking a risky behaviour, suffering from emotional disorders and with a lower productivity (Brook, Balka, & Witheman, 1999). Substance abuse is the harmful, non-medical use of mind altering substance which may lead to personality and behavioural problems (Nault, 1997). It implies the use of any substance under international control outside therapeutic indications, in excessive dose levels, or over an unjustified period of time. Substance abuse refers to any drug used for the wrong reasons in excessive doses. Psycho-active drugs, also called mood altering substances, are the most commonly abused drugs. These include but are not limited to street drugs such as dagga (also called marijuana or cannabis), cocaine, crack, heroin and mandrax but also include medication not used legitimately to relieve pain (Colett, 2004). Tobacco and alcohol, which affect mood, behaviour and bodily functions, are examples of everyday substances that are abused. Generally, learners who abuse substance may have difficulty in establishing their (own)

identity, developing relationships or skills, gaining physical and emotional independence and preparing for the future responsible adulthood. It halts the learner's maturity causing him to continue immature behaviour into adulthood. For example, long-term dagga use can affect memory and the ability to process information. In particular, dagga has a negative impact on mathematics test scores (Brook, Balka, & Witheman, 1999). On the other hand, Cunningham (1993) found that of high schools have used alcohol. He indicated that drinking among this age group is considered 'normal' where males are twice as likely as females to drink daily, which disturbs their concentration and their level of performance at school.

**Purpose of the Study**

Different valuable studies have been added to existing body of knowledge developing various models, e.g. linear regression models, logistic regression models and ANOVA, to assess the learners' performances; however most of them relied both on the advanced developed societies as their setting (Hijazi & Naqvi, 2006) and data about leaners (e.g. learners' test scores). This comparative cross-sectional study followed ex-post facto design. A cross-sectional design has the advantage of measuring current attitudes or practices of individuals within a short period of time (Creswell, 2012). The objectives of this study were

a) to explore the perceptions of Grade 12 learners on factors that influence their performances in mathematics, and
b) to suggest intervention strategy to improve learners' performance.

To achieve the above objectives, the following hypothesis was developed:

*There is significant association between learners' gender and each item of the school environment, parents' attributes and learner attributes*.

The items comprising school environment were limited to substance abuse, command of English language, overcrowding and school quintile. Parents' attributes included parents' education, SES of the family, and parental involvement with learners' school-work, and learner attributes included gender of a learner, age of a learner and learners' attitudes.

**Significance of the Study**

The research would be useful to educational administrators and planners, researchers, educators and non-governmental organisations working on effects of learner-gender, given other constrains or covariates, in mathematical studies. All these stakeholders will appreciate the perceptions of learners with regards to the effects of factors that contribute towards their mathematics' performances. As such, proper considerations and adjustments for covariates may be properly effected when devising intervention strategies that are aimed either at improving learners' performances in mathematics or assisting learners with the learning of mathematics.

**Scope and Delimitation of the Study**

The research is limited to public secondary schools, also called government schools, in the Sekgosese cluster of Limpopo Province; wherein a random sample of 113 participants (38

male and 75 female learners) voluntarily took part in the study. The collected data was categorical in nature. Only Likert-scaled items were used to assess the perceptions of the participants. Where inference was performed, the interpretation of results from the test for association was performed at 0.05 error rate.

**Test for Association**

A categorical variable is one for which the measurement scale consists of a set of categories. For instance, academic results may use categories "competent" or "incompetent", or profession may be categorised into surgeon, doctor, educator, dentist, and so forth. (Field, 2000; 2005). Categorical variables are usually classified as being of two basic types: nominal and ordinal. Nominal variables involve categories that have no particular order such as race, while the categories associated with an ordinal variable have some inherent ordering (days of the week, etc.). Therefore, categorical variables take on values that are names or labels. These variables are often referred to as qualitative, to distinguish them from numerical-valued or quantitative variables (Agresti, 1996; Field, 2000). For categorical variables *X* and *Y* with *I* and *J* levels, respectively, one presents the *IJ* possible combinations of outcomes in in a rectangular table having *I* rows and *J* columns for the categories of *X* and *Y* respectively. The cells of the table, which contain frequency counts of outcomes, represent the *IJ* possible outcomes, and such a table is called a contingency table (Field, Discovering statistics using SPSS for Windows, 2005).

Suppose each subject or participant in a sample was randomly chosen from the target population, and then classified on two categorical responses, *X* and *Y* Denote the probability that *(X,Y)* falls in the cell in row *i* and column *j* such that $\pi_{ij} = P(X = i, Y = j)$. Then the probabilities $\{\pi_{ij}\}$ form the joint distribution of X and Y such that $\sum_{i,j} \pi_{ij} = 1$ (Field, Discovering statistics using SPSS for Windows, 2005; Pandis, 2016). The sample joint distribution is denoted by $\{p_{ij}\}$, which are the sample cell proportions. The cell counts $\{n_{ij}\}$ are such that $n = \sum_{i,j} n_{ij}$ is the sample size, and $p_{ij} = {}^{n_{ij}}/_{n}$ (Pandis, 2016) and the marginal frequencies are the row and the column totals $\{n_{i+}\}$and $\{n_{+j}\}$, respectively.

Hypothesis is defined as a statement that can be questioned or tested, and that may be refuted in scientific studies (Martínez-Mesa, González-Chica, Bastos, Bonamigo, & Duquia, 2014). As alluded by, among others, Julious (2010) and Gonzalez-Chica, Bastos, Duquia, Bonamigo and Martínez-Mesa (2015), along with the null hypothesis ($H_0$- the original assumption of no difference or no association that is accepted as being true for a given situation), there is the alternative hypothesis ($H_A$- an additional explanation for the same situation, which may replace $H_0$ and needs to be tested).The Pearson chi-square

statistic for testing the hypothesis $H_0$ is $\chi^2 = \sum \frac{(n_{ij} - \mu_{ij})^2}{\mu_{ij}}$, where $\mu_{ij}$ is an expected count such that $\{\mu_{ij} = n\pi_{ij}\}$ and $n_{ij}$ is the cell count, also called observed count. In other words, the Pearson chi-square test is a nonparametric test used for two specific purpose: (a) To test the hypothesis of no association between two or more groups, population or criteria (i.e. to check independence between two variables); (b) and to test how likely the observed distribution of data fits with the distribution that is expected (Rana & Singhal, 2015). This statistic takes its minimum value of zero when all $n_{ij} = \mu_{ij}$. For a fixed sample size, greater differences between $\{n_{ij}\}$ and $\{\mu_{ij}\}$ produce larger $\chi^2$ values and stronger evidence against $H_0$ (Agresti, 1996, p. 28). The null hypothesis of statistical independence of two responses has the form $H_0: \pi_{ij} = \pi_{i+}\pi_{+j}$ for all *i* and *j* where the marginal distributions are the row and column totals of the joint probabilities, denoted by $\{\pi_{i+}\}$ and $\{\pi_{+j}\}$ for the row variable and column variable, respectively, and the subscript "+" denotes the sum over the index it replaces.

To test $H_0, \mu_{ij} = n\pi_{i+}\pi_{+j}$, is identified as the expected frequency, where $\mu_{ij}$ is the expected value of $n_{ij}$ assuming independence. The expected frequencies are estimate by substituting sample proportions for the unknown probabilities, giving the estimated frequencies $\hat{\mu}_{ij} = np_{i+}p_{+j} = \frac{n_{i+}n_{+j}}{n}$ (Pandis, 2016). For testing independence in $I \times J$ contingency table, the Pearson chi-square statistic $\chi^2 = \sum \frac{(n_{ij} - \hat{\mu}_{ij})^2}{\hat{\mu}_{ij}}$ is used (Collett, 1991; Field, 2005). Its larger-sample chi-squared distribution has degrees of freedom $df = (I-1)(J-1)$ meaning under $H_0$, $\{\pi_{i+}\}$ and $\{\pi_{+j}\}$ determine the cell probabilities (Agresti, 1996). The Chi-square statistic is a non-parametric (distribution free) tool designed to analyse group differences when the dependent variable is measured at a nominal level. Like all non-parametric statistics, the Chi-square is robust with respect to the distribution of the data. Specifically, it does not require equality of variances among the study groups or homoscedasticity in the data (McHugh, 2013). It is immediately noted that chi-square test for independence indicates the degree of an association (Agresti, 1996; Bilankulu, Rankhumise, & Letsoalo, 2014). It is rarely adequate for answering all questions about a dataset (Agresti, 1996, p. 35; Pandis, 2016).

## Material and Methods

This cross-sectional and comparative study followed a quantitative research design, which is a formal, objective, systematic process for obtaining quantifiable information about the world (Ellis-Jacobs, 2011). In a cross-sectional study, researchers or investigators take a measurements (e.g., of a health condition or problem and a factor they believe to be related) at a single point in time (a snapshot). There is no review of past circumstances,

knowledge of whether the exposure came before the endpoint or observation of change over time (Hua & David, 2008).

A combination of Stata V14 (StataCorp, 2015) and Excel (Microsoft, 2013) software packages were used for data management, and the statistical software package used to analyse the secondary data that was used in this study is Stata V14 (StataCorp, 2015).

A simple random sample of 113 participants, 38 male and 75 female learners, from Sekgosese cluster of the Limpopo Province's Department of Basic Education constituted the study population. Frequencies and proportions (expressed as percentages) were used to describe the collected data and Pearson's chi-squared test was used to test for association between any pair of categorical variables of interest (Bilankulu, Rankhumise, & Letsoalo, 2014). Under the null hypothesis, there is no association between the two categorical variables (Field, Discovering statistics using SPSS for Windows, 2005; Bilankulu, Rankhumise, & Letsoalo, 2014; Pandis, 2016). If the significance value is small enough (conventionally $p < 0.05$) then we reject the hypothesis that the variables are independent and accept the hypothesis that the variables are in some way related (Field, 2005). Therefore, the interpretation of results was performed at $\alpha = 0.05$ error rate.

It is necessary to ensure the reliability, the degree of consistency that an instrument or data collection procedure demonstrates, and accuracy of the research instruments. Validity is the quality of the collection procedure of the data that enables it to measure what it intends to measure. The instrument used 5-point Likert-scale, which are Strongly agree, Agree, Neutral, Disagree and Strongly disagree, to measure the extent to which the participants agree or disagree with the items (or statements). The reliability coefficient (also called Cronbach's alpha), with a cut-off point of 0.7 (Bilankulu et al., 2014), was used to test for internal consistency; and it was found to be 0.7004. Therefore, the items were reliably testing the envisaged latent construct (Learners' perception). The questionnaires had two sections. Section A of the questionnaire required the participants to provide demographic information while Section B focused on learners' opinion on factors that affect their (learners') performances in mathematics.

## Results

The results given are combined opinions or responses of 113 Grade 12 learners or matriculation learners who have enrolled for mathematics (n=101; 89.38%) and those who have not ( n=12; 10.62%). Matriculation refers to the final year of high school or secondary school. The independent variable of interest was gender, which indicates whether or not a participant was a male or female learner. For the purpose of interpretation, agree and strongly agree responses for each item were collapsed to form a cumulative agree. Similarly, disagree and strongly disagree formed cumulative disagree. The results in this study were presented in tabular format.

***a) Parents' Attributes***

Table 1 presents the findings after applying test for association between gender and each of parents' education, socioeconomic status and parental involvement in learners' school work (and in particular, learners' mathematics learning process). The insignificant associations between gender and socioeconomic status (p = 0.502), and parental involvement (p = 0.142) were observed. Therefore, male and female learners did not significantly differ in their opinions with regard to the effect of socioeconomic status of their parents and with the involvement of parents in their (learners') academic works.

**Table 1: Test for association of gender and each of the parents' attributes**

| Parents' Attributes | **Education of Parents** | **Socioeconomic Status** | **Parental Involvement** |
|---|---|---|---|
| p-value | 0.026 | 0.502 | 0.142 |

The significant association between gender of the participant and their perception regarding education of parents was observed ($p = 0.026$). Therefore, male and female learners had differing perceptions on the education level of parents. In other words, the proportion of male learners to the proportion of female learners was significantly different in the levels of agreement with regard to the effect of parents' education on poor performances of learners in mathematics.

**Table 2: Cross-tabulation of gender and parents' education (Proportions expressed as percentage)**

| Parents' Educational Status | **Gender of a Participant** | | | | **Total** | |
|---|---|---|---|---|---|---|
| | **Male** | | **Female** | | | |
| | **Count** | **Percent** | **Count** | **Percent** | **Count** | **Percent** |
| Strongly Disagree | 14 | 42.42 | 19 | 57.58 | 33 | 100.00 |
| Disagree | 2 | 9.52 | 19 | 90.48 | 21 | 100.00 |
| Neutral | 8 | 42.11 | 11 | 57.89 | 19 | 100.00 |
| Agree | 10 | 50.00 | 10 | 50.00 | 20 | 100.00 |
| Strongly Agree | 2 | 16.67 | 10 | 83.33 | 12 | 100.00 |
| **Total** | **36** | **34.29** | **69** | **65.71** | **105** | 100.00 |
| *Pearson's chi-square = 11.0462* | | | | | *p-value = 0.026* | |

Table 2 shows that higher proportion of female learners (n = 38 out of 69; 55.07%) than proportion of male learners (n = 16 out of 36; 44.44%) disagreed with the fact that parents' education contributes towards learners' poor performances in mathematics. Similarly, higher proportion of male learners (n = 12 out of 36; 33.33%) than proportion of female learners (n = 20 out of 69; 28.98%) agrees with the fact that parents' education attainment

contribute negatively towards the poor performances of learners in mathematics. Otherwise, male learners' proportion (n = 8 out of 36; 22.22%) was marginally higher than female learners' proportion (n = 11 out of 69; 15.94%) in the indecisive category.

Table 3 shows that most of the participants disagreed with the statements that education of parents ($n = 54$ out of $105; 51.43\%$) and SES ($n = 45$ out of $105; 42.85\%$) ) contribute towards learners' poor performances in mathematics. Although those who agreed ($n = 42$ out of $104; 40.39\%$) and those who disagreed ($n = 41$ out of $104; 39.43\%$) that parental involvement contributes towards poor performances of learners in mathematics are comparable, those who agreed were marginally more than those who disagreed.

**Table 3: Distribution of responses according to parents' attributes**

| Responses | Parents' Educational Status | | Socioeconomic Status | | Parental Involvement | |
|---|---|---|---|---|---|---|
| | Count | Percent | Count | Percent | Count | Percent |
| Strongly Disagree | 33 | 31.43 | 18 | 17.14 | 18 | 17.31 |
| Disagree | 21 | 20.00 | 27 | 25.71 | 24 | 23.08 |
| Neutral | 19 | 18.10 | 24 | 22.86 | 21 | 20.19 |
| Agree | 20 | 19.05 | 30 | 28.57 | 23 | 22.12 |
| Strongly Agree | 12 | 11.43 | 6 | 5.71 | 18 | 17.31 |
| Total | 105 | 100.00 | 105 | 100.00 | 104 | 100.00 |

***b) Learner Attributes***

Male and female learners' perceptions were not significantly different with respect to age of learner ($p = 0.295$), gender of a learner ($p = 0.816$), learner absenteeism (p = 0.484), learner attitude towards mathematics ($p = 0.208$) and punctuality to class ($p = 0.693$). Therefore, the association between gender of the participant and any of gender of the learner, attitude of the learner, punctuality in class, learner absenteeism, and age of the learner is not significant. Table  makes this explanation more explicit.

**Table 4: Test for association of gender and each of the learner attributes**

| Learner Attributes | Age | Gender | Absenteeism | Attitude | Punctuality |
|---|---|---|---|---|---|
| p-value | 0.295 | 0.816 | 0.484 | 0.208 | 0.693 |

Table  5  shows that most of the participants disagreed with the fact that gender of a learner ($n = 85$ of $109; 77.98\%$) and age of a learner ($n = 79$ out of $108; 73.15\%$),

contribute to poor performance of learners in mathematics. On the other hand, most of the participants agree that absenteeism ($n = 81$ of $111$; $72.97\%$), attitude ($n = 89$ of $109$; $81.65\%$) and punctuality ($n = 57$ of $108$; $52.77\%$) contribute towards poor performances of learners in mathematics.

**Table 5: Distribution of responses according to learner attributes**

| Responses | Gender of a Learner | | Age of a Learner | | Learner Absenteeism | | Learner Attitude | | Punctuality in Class | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Count | Percent | Count | Percent | Count | Percent | Count | Percent | Count | Percent |
| Strongly Disagree | 63 | 57.80 | 45 | 41.67 | 10 | 9.01 | 3 | 2.75 | 11 | 10.19 |
| Disagree | 22 | 20.18 | 34 | 31.48 | 6 | 5.41 | 8 | 7.34 | 11 | 10.19 |
| Neutral | 11 | 10.09 | 11 | 10.19 | 14 | 12.61 | 9 | 8.26 | 29 | 26.85 |
| Agree | 11 | 10.09 | 11 | 10.19 | 38 | 34.23 | 27 | 24.77 | 31 | 28.70 |
| Strongly Agree | 2 | 1.83 | 7 | 6.48 | 43 | 38.74 | 62 | 56.88 | 26 | 24.07 |
| **Total** | 109 | 100.00 | 108 | 100.00 | 111 | 100.00 | 109 | 100.00 | 108 | 100.00 |

**c) School Environment**

Gender and substance abuse ($p = 0.485$), command of English language ($p = 0.457$), overcrowding in a classroom ($p = 0.182$), and school quintile ($p = 0.749$) were not significantly associated. Therefore, the proportions of male learners to the proportion of female learners did not differ in the categories of school factors, as given in Table 6.

Male and female participants did not have significant differing perceptions, views or opinions regarding the effects of attitude of the learner towards the subject itself (mathematics), school quintile, overcrowding, command of English language, and the contribution of substance abuse towards poor performance in mathematics.

**Table 6: Test for association of gender and each of the school factors**

| School Factors | Substance Abuse | English Language Proficiency | Overcrowding | School Quintile |
|---|---|---|---|---|
| p-value | 0.483 | 0.457 | 0.182 | 0.749 |

Table 7 shows that the cumulative percentage of $60.00\%$ ($n = 66$ out of $110$), $50.00\%$ ($n = 54$ out of $108$) and 44.03% ($n = 48$ out of $109$) agreed that substance abuse, overcrowding and good command of English language, respectively, contribute towards learners' poor performances in mathematics. On the other hand,

29.70% ($n = 30$ out of 101) of the participants disagree that school quintile contribute towards poor performances in mathematics. However, participants who agree ($n = 27$; 26.73%) and participants who disagree ($n = 30$; 29.70%) that school quintile contribute towards learners' poor performances in mathematics are comparable. It was observed that there were higher proportions of participants in the neutral categories of the effect of school quintile ($n = 44$ out of 101; 43.56%) and command of English language ($n = 42$ out of 109; 38.53% ).

**Table 7: Distribution of responses according to school factors**

| Responses | Substance Abuse | | Overcrowding | | School Quintile | | English Language Proficiency | |
|---|---|---|---|---|---|---|---|---|
| | Count | Percent | Count | Percent | Count | Percent | Count | Percent |
| Strongly Disagree | 22 | 20.00 | 11 | 10.19 | 15 | 14.85 | 6 | 5.50 |
| Disagree | 11 | 10.00 | 19 | 17.59 | 15 | 14.85 | 13 | 11.93 |
| Neutral | 11 | 10.00 | 24 | 22.22 | 44 | 43.56 | 42 | 38.53 |
| Agree | 24 | 21.82 | 26 | 24.07 | 17 | 16.83 | 34 | 31.19 |
| Strongly Agree | 42 | 38.18 | 28 | 25.93 | 10 | 9.90 | 14 | 12.84 |
| Total | 110 | 100.00 | 108 | 100.00 | 101 | 100.00 | 109 | 100.00 |

## Discussion

Parents' education plays a very crucial role in the performances of learners at school. In particular, mothers' educational level is a significant predictor of school completion (Lacour & Tissington, 2011). Although the findings are such that male and female participants had differing opinions about the effect of parents' educational level i.e. gender and parents education were found to be significantly associated, majority of the participants did not agree that parents' education contribute to poor performance of learners in mathematics. Among others, Howie (2003), and Visser and Juan (2015) found that learners from higher socioeconomic backgrounds, who spoke the language of the test at home, and had one parent with at least a Grade 12 education qualification performed better in mathematics. The findings in this study concur with the findings by Peter and Mullis (1997), Lacour and Tissington (2011), and Visser and Juan (2015) that parents education is a significant predictor of learners' performances.

Substance abuse has negative effect on academic learning process (Schweinsburg, Brown, & Tapert, 2008). Someone who smokes marijuana daily may be functioning at a reduced intellectual level most or all of the time. Not surprisingly, evidence suggests that, compared with their non-smoking peers, learners who smoke dagga tend to get lower grades and are more likely to drop out of high school (Fergusson & Boden, 2008). Early drug or alcohol use may have potentially long-lasting consequences (Grant, 1988; Cleaver, Unell, & Aldgate, 2011). Early onset of alcohol or other drug use is one of the strongest predictors of

later alcohol dependence (Grant, 1988). As in Schweinsburg, Brown and Tapert (2008) and Fergusson and Boden (2008), it was observed in this study that male and female participants differed insignificantly on the fact that substance abuse contributes negatively towards learners' poor performances. In particular, it was found that most of the participants agree that substance abuse contributes negatively towards learners' poor performances in mathematics.

Many research outcomes confirm a strong link between attendance and learner SES. Compared to more affluent learners, children living in poverty are 25% more likely to miss three or more days of school per month (Ready, 2010). While some learner absences are unavoidable and understandable due to illness and the like, or enforced through school disciplinary absences, many are not. These could be unexplained or unauthorised absences. Poor school attendance can be linked to a number of related short term adverse outcomes and long term adverse outcomes for learners including lower academic outcomes, early school leaving, substance use, poverty, unemployment and negative health outcomes. However these factors may be interrelated in complex ways and factors that lead to low levels of attendance may also independently lead to some of these adverse outcomes. Absenteeism and gender were found not to be significantly associated. However, participants agreed that absenteeism contributes towards poor performances.

The importance of the type of school a learner attends influences educational outcomes. Therefore, schools have independent effect on learner attainment. Studies have found that school quintile is significantly associated with learner performance. For example, van der Berg (2007) found that very poor schools (quintiles 1 and 2) were negative and significant in low performing schools and yielded different insignificant results elsewhere. Quintiles 3 to 5 were significant determinants of pass rates for low and middle performing schools, and were significantly strong to increase the dispersion on pass rates. As with the findings of van der Berg (2007) and Stols (2013) that revealed that lower school quintile contributes negatively towards learners' performance; majority of participants agreed that lower school quintile has negative effect on learners' performances in mathematics. Male and female participants did not differ significantly that lower school quintile is a contributor towards learners' poor performances.

The effect of gender in influencing mathematical achievement is a very controversial issue. Mathematics is often considered to be a domain in which male learners are higher achievers, both in terms of attitudes and self-concept. For example, a qualitative study conducted by Moreno and Mayer (2009) and Olarewaju and Awofala (2011) suggests that male learners perform better than female learners in mathematics especially on solving a problem. However, no gender differences emerged for mathematics performance in studies conducted by Lindberg, Hyde, Petersen and Linn (2010), and Devine, Fawcett, Szűcs and Dowker (2012). Hedges and Newell (1999) found that female learners had an advantage in reading and writing i.e., female learners had an advantage in fundamental learning areas (Jovanovic & King, 1998; Demirbas & Demirkan, 2007; Nuzhat, Salem, Hamdan, & Ashour, 2013; Awodun, Oni, & Oyeniyi, 2015). Jelas and Daham (2010) have shown that

female learners perform better than male learners across almost all school subjects. The issue of gender comparisons should be treated with caution. Demirbas and Demirkan (2007) and Sunday and Zaku (2013) warn that findings on gender are inconclusive since different researchers have different opinions based on their findings regarding gender effect on learners' academic performance.

## Recommendations

In view of the findings of this study, namely; the literature review and the empirical investigation, it can be recommended that:

***Substance abuse***

Balsa, Giuliano and French (2011) found that, in general, increases in alcohol consumption result in statistically significant but quantitatively small reductions in overall academic performances for male students and in statistically non-significant changes for females. The absence of drugs or drug inaccessibility to learners will go a long way in providing environment wherein learners are more likely to perform better in their academic work, especially in mathematics. All stakeholders, Department of Basic Education, parents, education managers, and teacher organisations may have to conduct workshops for the educators in which reasons for learners to use drug, ways of identify learners who are drug abusers, procedures to follow when a learner is suspected of being a drug user or abuser, ways of interacting with learners who are suspected to be drug user, are given attention. For brevity, the workshops have to include the participation of psychologists and psychiatrists.

***Absenteeism***

There is a correlation between learners' attendance rates at school and academic performance. In particular, every day absent may be impacting on learner performance - thus, for school attendance, every day counts. However, this relationship does not subscribe to the notion of cause-and-effect, since the relationship is likely to be complex and impacted upon by the range of other factors. The relationship exists between SES and school attendance, and this relationship is such that on average, learners from lower SES areas (neighbourhood) exhibit lower attendance rates (Ready, 2010). In particular, learners from lower SES backgrounds tend to exhibit higher levels of unauthorised and unexplained attendance. The intervention at the SES level may minimise the rate of bunking classes or school. Ultimately, learners' performances (especially in mathematics) are more likely to improve.

As emphasised by Moore (2004) – one can improve the attendance and academic performance of some learners by emphasising the empirical relationship of attendance and performance (grade). Moore (2004) further says high rates of class-attendance are significant indicator of better academic performances, and could therefore be an important criterion for educational authorities wanting to improve matriculation learners' chances for academic success.

***School quintile***

In South African context, under-sourced schools are more likely to be in poor communities and rural settlements. The authorities and the South African government may be advised to redistribute resources in such a way that rural schools attract quality educators by introducing the so-called rural incentives for educators, and start investing in the infrastructure in those areas. Although resources are not directly linked or associated with improvement of learning outcome; for resources may be necessary but they are not sufficient, differences in their effects depend on differences in their use. Stakeholders (authorities, educators and community at large) in under-resourced schools must engage in school improvement plan (SIP) so that these schools progress towards whole-school development; for if stakeholders do not get involved in the planning process, and the SIP does not contain specific and measurable targets and there is no proper analysis of educators' and leaners' performance and attendance and the monitoring of these issues is not systematic then the under-resourced schools will remain poor-performing schools (van der Voort & Wood, 2014). With the focus on performances in mathematics then poor-performing includes (poor) performances in mathematics.

***Parents' educational level***

Parents' education status may be associated to SES. Sole parent families on average have lower levels of income, and are headed by parents with lower educational attainments. Therefore, learners from these families are likely to have lower educational performances. Visser and Juan (2015) revealed that learners with one parent with at least a matriculation or Grade 12 education qualification performed better in mathematics. As quantified by Peters and Mullis (1997), mothers' education level has 20% higher effect than the fathers' education level on the learners' academic outcomes. Therefore, it may be encouraged that people should stay longer in education system up to the first post-secondary school qualification; for the nett-effect will be that their children will have better chances of staying longer in the schooling system and better chances of performing better especially in mathematics.

***Attitude***

Affective factors have significant effect on learning. Attitude to mathematics and its teaching are significant contributors to an educator's make-up and approach, because of the effect they can have on a learner's attitudes to mathematics and its learning. Broadly, the learners' performance in certain subjects depends on their attitude towards the subject. Positive attitude towards the subjects will encourage a person to learn the subject much better. Learners' attitudes need to be fostered throughout the process of teaching and learning in order to have a good achievement. Thus, new ways of presenting mathematics material may go a long way in changing the perceptions of learners towards mathematics. It may be acknowledged that mathematics sharpens the reasoning powers of an individual and increases his or her mental alertness. Therefore, mathematics has a most important bearing on the intellect as such; for its study promotes habits of accuracy and exactitude, and prevents one from being careless and slipshod. Long-term use of concrete materials is

positively related to increases in learner mathematics achievement and improved attitudes towards mathematics (Drews & Hansen, 2007).

Learners' attitudes can also be improved by creating an effective learning environment, an environment wherein knowledge is constructed by a learner. The suggested approaches or strategies may go a long way in developing positive attitudes of learners towards learning mathematics. Accordingly, learners' attitudes towards mathematics are very much correlated to their attitude towards problem solving in general. Therefore, negative attitudes towards mathematics need to be overcome, so that learners triumph over challenges of problem-solving. As Thomas and Higbee (2000) have noted, "The best ... teacher, no matter how intellectually stimulating, no matter how clear in providing explanations and examples, may not be able to reach the high risk freshman who has no real interest in learning ... and will certainly not be successful with the student who fails to show up for class".

## Conclusion

Creating the conditions that foster learner success in the learning of mathematics in secondary schools has never been more important. Although many studies found significant disparities between male and female learners in academic performances e.g. Moreno and Mayer (2009) and Letsoalo et al., (2016); this study revealed that male and female learners share similar perceptions about the factors that have significant effects on their mathematics performances, with the exception of parents' educational status. Interventions that aim to increase mathematics performance cannot be solely aimed at the school level. Mathematics educators must be (made) aware of the effect of various factors, being school based factors and out-of-school based factors, on the achievement of their learners in order to compensate for any deficiencies. For example, social category primes can affect the attitudes of stereotyped group members (Steele & Ambady, 2006), and teaching style used in the process of teaching and learning has a significant impact on learners' attitudes (i.e. interest and understanding) towards the subject. Therefore, as revealed by Adediwura and Tayo (2007), learners' perception on educators' knowledge of subject matter, attitude to work and teaching skills has a significant relationship to learners' mathematics' performance.

The use of English language as the language of teaching and learning remains a controversial issue in South Africa. Policies regarding language as a resource for learning demand rigorous research that will focus on using home language as an enriching tool rather than just one of the subjects to be taught at school (Visser & Juan, 2015). Arsad, Buniyamin and AB Manan (2014) established that it was not so much the language per se which had an effect on the academic performance; it was rather the efficacy of usage of the chosen language and other periphery issues in both formal and formal environments.

Most of university degrees or post school qualifications require mathematics. Learners who choose not to take mathematics seriously or to ignore it in high school forfeit many future career opportunities that they could have. They essentially turn their backs on more than

half the job market. The importance of mathematics for potential careers cannot be over emphasised. To get degrees in the following areas one need to have good knowledge of mathematics and statistics (or numerical data handling acumen). Therefore, knowledge of mathematics is indispensable both for the public person (in the street) as well as for scientists and philosophers.

When dealing with factors that have (significant) effect on learners' mathematics' outcomes – interventions should be geared towards treating them as a cluster-of-factors. Therefore, these factors are inter-connected, and some are strongly and or significantly associated with one another, and with the outcome of interest (learner performance). The findings in this study are limited to Sekgosese Cluster in the Limpopo Province. Future research should examine whether the present findings generalise to other samples and settings.

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**Reference**

Adediwura, A. A., & Tayo, B. (2007). Perception of teachers' knowledge, attitude and teaching skills as predictor of academic performance in Nigerian secondary school. Academic Journal, 2(7), 165 - 171.

Agresti, A. (1996). An introduction to categorical data analysis. New York: John Wiley & Sons, INC.

Aiken, L. R. (1970). Attitudes towards mathematics. Review of Educational Research, 40, 511 - 596.

Arsad, P. M., Bunuyamin, N., & AB Manan , J. (2014). Students' English language proficiency and its impact on the overall student's academic performance: An analysis and prediction using Neural Network Model. WSEAS TRANSACTIONS on ADVANCES in ENGINEERING EDUCATION, 11, 44 - 53.

Ashmore, R. D., & Dell Boca, F. K. (2015). Conceptual approaches to stereotypes and stereotyping. In D. L. Hamilton, Cognitive processes in stereotyping and intergroup behavior (pp. 1 - 36). London: Psychology Press.

Awodun, A., Oni, S., & Oyeniyi, J. (2015). Influence of teacher's gender on secondary school students' performance in physics in Ekiti State, Nigeria. International Journal of Innovative Research and Development, 4(1), 72 - 77.

Balsa, A. I., Giuliano, L. M., & French, M. T. (2011). The effects of alcohol use on academic achievement in high school. Economics of Education Review, 30(1), 1 - 15. Retrieved from http://doi.org/10.1016/j.econedurev.2010.06.015

Battle, J., & Michael, L. (2002). The increasing significance of class: The relative effects of race and socioeconomic status on academic achievement. The Journal of Poverty, 6(2), 21 - 35.

Bilankulu, C., Rankhumise, E. M., & Letsoalo, M. E. (2014). Business owners' perspective on corporate social investment. J Economics, 5(3), 297 - 306.

Breslich, E. (1966). Breslich, E. 1966. Importance of mathematics in general education. The Mathematics Teacher, 59(5), 464-469. Retrieved from http://www.jstor.org/stable/27957386. The Mathematics Teacher, 59(5), 464 - 469.

Brook, S., Balka, B., & Witheman, M. (1999). The risks for late adolescence of early adolescent marijuana use. American Journal of Public Health, 89, 1549 - 1554.

Buckingham, J. (1999). The puzzle of boys' educational decline: A review of the evidence. Issue Analysis, No.9. Sydney: Centre or Independent Studies.

Cleaver, H., Unell, I., & Aldgate, J. (2011). Children's needs – parenting capacity child abuse: Parental mental illness, learning disability, substance misuse, and domestic violence (2 ed.). London: The Stationery Office.

Colett, A. (2004). Talking about drug abuse. Cape Town: Struik Publishers. Cape Town: Struik Publishers.

Collett, D. (1991). Modeling Binary Data. New York: Chapman & Hall.

Considine, G., & Zappala, G. (2002). Factors influencing the educational performance of students from disadvantaged backgrounds. In T. Eardley, & B. Bradbury, Competing visions: Refereed proceedings of the national Social Policy Conference 2001 (pp. 91 - 107). Sydney: Social Policy Research Centre, University of South Wales.

Creswell, J. W. (2012). Educational research: Planning, conducting and evaluating quantitative and qualitative research. New Jersey: Pearson Education, Inc.

Cunningham, B. (1993). Child Development. New York: Haper Collins Publishers.

Demirbas, O., & Demirkan, H. (2007). Learning styles of design students and the relationship of academic performance and gender in design education. Learning and Instruction, 17, 345 - 359.

Devine, A., Fawcett, K., Szűcs, D., & Dowker, A. (2012). Gender differences in mathematics anxiety and the relation to mathematics performance while controlling for test anxiety. Behaviorsl and Brain Functions: BBF, 8(33). Retrieved from http://doi.org/10.1186/1744-9081-8-33

Drews, D., & Hansen, A. (2007). Using resources to support mathematical thinking, primary and early years. London: Learning Matters Ltd.

Ellis-Jacobs, K. A. (2011). Quantitative correlational study on the impact of patient satisfaction on a rural hospital. The Internet Journal of Allied Health Sciences and Practice, 9(4), Article 8.

Ferguson, H., Bovaird, S., & Mueller, M. (2007). The impact of poverty on educational outcomes for children. Paediatrics & Child Health, 12(8), 701 - 706.

Fergusson, D., & Boden, J. (2008). Cannabis use and later life outcomes. Addiction, 103(6), 969 - 976.

Field, A. (2000). Discovering statistics using SPSS for Windows. London: SAGE Publications, Inc.

Field, A. (2005). Discovering statistics using SPSS for Windows (2nd ed.). SAGE Publications, Inc.

Gonzalez-Chica, D. A., Bastos, J. L., Duquia, R. P., Bonamigo, R. R., & Martínez-Mesa, J. (2015). Tests of association: which one is the most appropriate for my study? An Bras Dermatol, 90(4), 523 - 528.

Graetz, B. (1995). Socio-economic status in education research and policy. In J. Ainley, Socio-economic status and school education. Canberra: DEET/ACER.

Grant, B. (1988). The impact of a family history of alcoholism on the relationship between age at onset of alcohol use and DSM–IV alcohol dependence: Results of the national longitudinal alcohol epidemiologic survey. Alcohol Health & Research World, 2, 144 - 147.

Hedges, L., & Newell, A. (1999). Changes in the black-white gap in achievement scores. Bangladesh e-Journal of Sociology, 72(2), 149 - 182.

Hedrick, E. (1917). The Significance of Mathematics. The American Mathematical Monthly, 24(9), 401 - 406. doi:10.2307/2972761

Hijazi, S. T., & Naqvi, S. M. (2006, January). Fators affecting students' performances: a case of colleges. Bangladesh e-Journal of Sociology, 3(1), 1 - 10.

Horne, R. (2000). The performance of males and females in school and tertiary education. Australian Quarterly, 72(5/6), 21 - 26.

Howie, S. J. (2003). Language and other background factors affecting secondary pupils' performance in mathematics in South Africa. African Journal of Research in SMT Education, 7, 1 - 20.

Hua, Z., & David, A. (2008). Study design: cross-sectional, longitudinal, case, and group. In L. Wei, & M. G. Moyer, The blackwell guide to research methods in bilingualism and multilingualism. Oxford, UK: Blackwell Publishing Ltd. doi:10.1002/978

International Council of Nurses. (2004). Nurses: Working with the poor against poverty. Retrieved June 12, 2017, from http://www.icn.ch/indkit2004.pdf

Jabor, M. K., Machtmes, K., Kungu, K., Buntat, Y., & Safarin, N. M. (2011). The influence of age and gender on the students' achievement in mathematics. International Conference on Social Science and Humanity, 5, pp. 304 - 308.

Jelas, Z. M., & Dahan, H. M. (2010). Gender and educational performance: The Malaysian perspective. Procedia Social and Behavioral Sciences, 7(C), 720 - 727.

Jovanovic, J., & King, S. (1998). Boys and girls in the performance-based science classroom: Who's doing the performing? American Educational Research Journal, 35(3), 477 - 496.

Julious, S. (2010). Sample size for clinical trials. London: Chapman & Hall.

Kyei, K. A., & Nemaorani, T. M. (2014). Establishing factors that affect performance of grade ten students in high school: A case study of Vhembe District in South Africa. Journal of Emerging Trends in Educational research and Policy Studies, 5(7), 83 - 87.

Lacour, M., & Tissington, D. (2011). The effect of poverty on academic achievement. Educational Research and Reviews, 6(7), 522 - 527.

Letsoalo, M. E., Maoto, R. S., Masha, J. K., & Lesaoana, A. M. (2016). Gender as a unit of analysis in clustered data: performances of male and female learners in Gauteng and Western Cape Provinces of South Africa. Gender and Behaviour, 14(2), 7504 - 7512.

Letsoalo, M. E., Maoto, R. S., Masha, J. K., & Lesaoana, M. A. (2017). The effect of gender on learner achievement in Gauteng and the Western Cape Provinces of South Africa. Gender and Behaviour, 15(2), 9177 - 9184.

Lindberg, S. M., Hyde, J. S., Petersen, J. L., & Linn, M. C. (2010). New trends in gender and mathmatics performance: A meta-analysis. Psychological Bulletin, 1123 - 1135.

Martínez-Mesa, J., González-Chica, D. A., Bastos, J. L., Bonamigo, R. R., & Duquia, R. P. (2014). Sample size: how many participants do I need in my research? An Bras Dermatol, 89, 609–615.

McHugh, M. L. (2013). The Chi-square test of independence. Biochem Med, 23(2), 143 - 146. doi:10.11613/BM.2013.018

Mendezabal, M. J. (2013). Study habits and attitudes: the road to academic success. International Journal of Applied Research and Studies, 2, 1 - 14.

Microsoft. (2013). Microsoft Excel [Computer Software]. Redmond, Washington: Microsoft.

Moore, R. (2004). Does improving developmental education students' understanding of the importance of class attendance improve students' attendance and academic performance? Research and Teaching in Developmental Education, 20(2), 24 - 39. Retrieved August 02, 2017, from http://www.jstor.org/stable/42802197

Moreno, R., & Mayer, R. E. (2009). Gender differences in responding to open-ended problemsolving questions. Learning and Individual Differences, 11, 355 - 364.

Nault, W. H. (1997). World book encyclopedia. Chicago: World Book Inc.

Nuzhat, A., Salem, R. O., Hamdan, N. A., & Ashour, N. (2013). Gender differences in learning styles and academic performance of medical students in Saudi Arabia. Medical Teacher, 35(s1), S78 - S82.

Okoro, C. C., Ekanem, I. E., & Udoh, N. A. (2012). Teacher gender and the academic performance of children in primary schools in Uyo Metropolis, Akwa Ibom State, Nigeria. Journal of Educational and Social Research, 2(1), 267 - 273.

Olarewaju, A., & Awofala, A. (2011). Is gender a factor in mathematics performance among Nigerian senior secondary students with varying school organization and location? International Journal of Mathematics Trends and Technology, 2(3), 17 - 21.

Pandis, N. P. (2016). The Chi-squared test. Am J Orthod Dentofacial Orthop, 150, 898 - 899.

Peters, H., & Mullis, N. (1997). The role of family income and sources of income in adolescent achievement. In G. Duncan, & J. Brooks-Gunn, Consequences of growing up poor (pp. 340 - 381). Russell Sage Foundation Press.

Phipps, S., & Lethbridge, L. (2007). Income and the outcomes of children. Retrieved from http://www.statcan.ca/english/research/11F0019MIE/11F0019MIE2006281.pdf

Rana, R., & Singhal, R. (2015). Chi-square test and its application in hypothesis testing. J Pract Cardiovasc Sci, 1, 69 - 71.

Ready, D. (2010). Socioeconomic disadvantage, school attendance, and early cognitive development: The differential effects of school exposure. Sociology of Education American, 83(4), 271 - 286.

Reyes, L., & Stanic, G. M. (1988). Race, sex, socioeconomic status, and mathematics. Journal for Research in Mathematics Education, 19(1), 26 - 43. doi:10.2307/749109

Rich, A. (2000). Beyond the classroom: How parents influence their children's education. Sydney: Centre for Independent Studies.

Schweinsburg, A., Brown, S., & Tapert, S. (2008). The influence of marijuana use on neurocognitive functioning in adolescents. Curr Drug Abuse Rev, 1(1), 99 - 111.

Sikhwari, T. D. (2016). Study habits, attitudes and academic achievements: Comparing Grade 12 learners between two secondary schools. Journal of Educational Studies, 15(2), 43 - 61.

Sirmaci, N. (2010). The relationship between the attitudes towards mathematics and learning styles. Procedia - Social and Behavioral Sciences, 10, 644 - 648.

StataCorp. (2015). Stata Statistical Software. (Version 14). College Station, TX: StataCorp LP.

Steele, J. R., & Ambady, N. (2006). "Math is hard!" The effect of gender priming on women's attitude. Journal of experimental social psychology, 42, 428 - 436.

Stols, G. (2013). An investigation into opportunity to learn that is available to grade 12 mathematics learners. South African Journal of Education, 33(1), 1 - 18.

Sunday, O. S., & Zaku, J. A. (2013). Gender analysis of students' entry qualification in english language in colleges of education in Kwara State. International Journal of Secondary Education, 1(5), 23 - 25.

Swanepoel, B. J., Erasmus, B. J., & Schenk, H. W. (2008). South African human resource management: Theory and practice. Cape Town: Van Schaiks.

Thomas, P. V., & Higbee, J. L. (2000). The relationship between involvement and success in developmental algebra. Journal of College Reading and Learning, 30(2), 222 - 232.

van der Berg, S. (2007). Apartheid's enduring legacy: Inequalities in education. Journal of African Economies, 16(5), 849 - 880.

van der Voort, G., & Wood, L. (2014). Assisting school management teams to construct their school improvement plans: An action learning approach. South African Journal of Education(34), 1 - 7.

Visser, M., & Juan, A. (2015). Home and school resources as predictors of mathematics performance in South Africa. South African Journal of Education, 35(1), 1 - 10.

Zakaria, E., Chin, L. C., & Daud, M. Y. (2010). The effects of cooperative learning on students' mathematics. Journal of Social Sciences, 6(2), 272 - 275.