

ZJER

ZIMBABWE JOURNAL OF EDUCATIONAL RESEARCH

Volume 20 Number 3, November 2008
ISSN 1013-3445

CONTENTS

Teachers' Coping in Financial Difficulties: A Case Study of the 'Classroom Tuck-shop Phenomenon' in Zimbabwean Urban Primary Schools in Norton
Beatrice Bondai and Francis Muchenje

The Relevance of Budget Preparation in School Administration
Fan Akapan Fan and Besong Joseph Besong

Job Stress, Job Dissatisfaction and Stress Related Illnesses among South African Educators

Karl Pelzer, Olive Shisana, Kahangelani Zuma, Brian Van Wyk, and Nompumelelo Zungu-Dirwayi

The Influence of Psychological and Societal Factors on Student Performance in Mathematics at the Senior Secondary School Level
O.A. Adegboye (Jnr)

Sex, HIV/AIDS and Students: A Baseline Study in Agona District in the Central Region of Ghana
Wisom Harrison K Hordzi

Information and Communication (ICT) Skills for Bachelor of Education Degree Students at the University of Zimbabwe: Implications for University Policy on a Computer Course for Undergraduate Student Teachers
Munyamadzi Alexander Zengeya

Conquest, Colonial Education and Cultural Uprootedness in Africa—the Role of Education for *Hunhu/Ubuntu* in de-rooting the African in Zimbabwe
N. Makuvaza

Theatre, Life Skills and Participatory Learning
Nehemiah Chivandikwa and Ruth Makumbirofa

The Zimbabwe Journal of Educational Research is published tri-annually by the University of Zimbabwe (UZ) Human Resources Research Centre (HRRC).

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THE INFLUENCE OF PSYCHOLOGICAL AND SOCIETAL FACTORS ON STUDENT PERFORMANCE IN MATHEMATICS AT THE SENIOR SECONDARY SCHOOL LEVEL

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Abstract

The study examined the influence of psychological and societal factors on students' performance in mathematics at Senior Secondary School Level in Ilorin metropolis of Kwara state. A simple random sampling technique was used to sample three hundred secondary school students who supplied information on the questionnaire. Each student was also given an academic achievement test to measure their performance in Mathematics. Average weighted response and correlational analysis were used to test the hypothesis. The result showed that psychological and societal factors are a significant influence on academic performance of Senior Secondary School students. It was also found that psychological factors exert a great influence on performance in mathematics. Based on the result, the researcher recommends that teachers, counsellors and parents should understand the psychological aspects of learning on their students/children in order to enhance their academic performance in mathematics.

Background of the study

Nigeria is said to be a nation in a hurry to catch up with the rest of the world in technological development. The nation wants to telescope into a very short period of time what has taken many developed countries of the world years to achieve. It is believed that this is not an impossible task to achieve, for nature has blessed our country with abundant human and natural resources. To catch up with the rest of the world, it is necessary for the nation to create an adequate reservoir of well-trained men and women, well-trained in mathematics at all levels of its working population. We must accept the fact that it is not an easy task to accomplish given the present status of the teaching of mathematics in Nigerian primary, secondary and tertiary institutions.

The great statesmen Napoleon rightly declared that the advancement and perfection of mathematics are intimately connected with the prosperity of a state. Thus, the importance of knowledge of mathematics in any nation cannot be overemphasized. For any meaningful development to exist there must be accomplishments in mathematics. Hence, the struggle to improve mathematics education in Nigeria must be fought on many fronts.

Although mathematics is made compulsory in all secondary schools, many students do not attend classes. Musa (1983) said that research reports have been offered several reasons for this. Ohuche (1991) pointed out that students stay away from mathematics in primary school because they are told that mathematics is a difficult subject. Ohuche stressed further that this general opinion of mathematics eventually has psychological effect on the students. Olubodun (1991) stressed that mathematics does not have to be frightening for the students whom it is involved. Mathematics, according to him requires devoted and active teachers, who can stimulate students.

Till the present time, much of the blame of students' low performance in mathematics has been placed on the teachers and the school administrators and very few researchers have ever considered the personality and emotional characteristics of the students as a threat to their success envisaged in the subject. Academic achievement has, thus, come to be related to personality of each student, his/her attitude towards a number of things, his/her academic background, the student's exposure to different educational climates and even the student's interests. These personal traits can have significant bearing on the student's academic achievement, (Balogun 1985, Soyinbo, 1982).

Psychological factors that affect people's mind and thoughts include the following: anxiety, aspiration, encouragement, incentive, interest, and self-fulfilling prophecy, feed back, personality traits, physical health, maturity, motivation and so on. An actual definition of anxiety that covers all these aspects is very difficult to provide (indeed whole books have been written on the subject). Everyone knows the feeling that we call anxiety. There is not a person who has not experienced some degree of anxiety whether it is the feeling upon entering a schoolroom just before an exam, or the feeling when one wakes in the middle of the night, certain that they heard a strange sound outside. What is less known, however, is that sensations such as extreme dizziness, spots and blurring of the eyes, numbness and tingling, stiff almost paralyzed muscles, and feelings of breathlessness extending to choking or smothering can also be

symptoms of anxiety. When these sensations occur and people do not understand why, then anxiety can increase to levels of panic since people imagine that they must have some disease. Anxiety is a response to danger or threat. Ron, Michelle and David. Hornby (in Duntoye, 1997) defined anxiety as the emotional condition in which there is fear and uncertainty about the future. He thought of anxiety as a very common symptom with a certain amount being useful to the individual as it acts as a stimulant and increase efficiency. Too much anxiety, according to him, has a reverse effect and interferes seriously with the patient's life. The anxious person will probably be nervous and disorganised under stress, including in any situation which he/she perceives as a potential threats. This means that anxiety of any form is likely to relate with failure of students in an academic encounter. Palemo, Cutanda and Macandles (in Ohushe, 1991) investigated the relationship between anxiety and performance on a fairly complex task, using fourth grade children. The results showed that the group of children with low anxiety scores made consistently fewer errors in performing the task than did the high anxiety group. These results, they said, suggested that high anxiety reduces efficiency in performance. Studies relating test anxiety to academic performance in college students have generally supported the hypothesis that test anxiety is associated with a significant performance decrease reflected in students GPA. (Adegboye Jnr and Adegboye, 2003). Similarly, Umoinyan, (1997) found out that anxiety factors are significant predictors of mathematical achievement. Umoinyan concludes that two anxiety factors (general and test) are inhibiting factors to mathematics achievement. It is worthy to state that, with the regression equation, an individual with general anxiety is more composed to achieve success while the test anxious ultimately become confused, thereby failing, resulting from the electrical stimulation of the data which induces fear.

Duntoye (1997) contended that social factors such as interest, personality and motivation are factors that contribute to children's choice of career. He asserted that motivation is the central factor in any learning process. A motivated individual can learn even if the instructional materials are seemingly inadequate. Duntoye stressed further that the academically motivated individual is interested in his subject for its own sake and has the capacity to tackle; independently and successfully both school work and examinations. However, research studies show that extreme levels of motivation are detrimental to high level of performance in mathematics.

According to Tuckman in Akinyele (2001), feedback from students can be an effective stimulus for teachers to change or vary their methods of teaching,

thereby improving the student's academic achievement. Many students fail their examination as a result of the feeling of hopelessness for them by their teachers.

Salau (2001) said that both home and school related factors have a combined influence on the academic achievement of students in mathematics. Salau calls on parents to show greater interest and commitment to the education of their children by creating a conducive atmosphere for learning at home. Akinleye (2001) expressed the belief that a child growing up in a crowded, noisy and disorganised home with few objects with which to play may be at some disadvantage for cognitive and social development. He also believed that education and socio-economic status of parents influence their children academic performance. Supporting this view, Back-house, Haggarity, Pirei and Stratto (1999), argued that the influence of a learner's family on a learner's ability to learn smathematics should not be under estimated. However, it is not easy to predict how a learner will react to this influence. Much depends on whether a learner has internalized family values, usually influenced by the peer group.

Bee (1985) stated that the children's attitude about school and their motivation to achieve as well as their actual achievements are strongly affected by the expectation and emotional climate of the school they attend. Parental educational level was also found to have a significant influence on student's academic performance because the parent's achievement, desire and ambition influence the child's desire to learn and to create harmony between the home and school (Adeyemo, 1990). Accordingly, Akinyele (2001) observed that the type of environment that affects children is the school they attend. Aiken and Dreger (1981) said that influence of peer group can serve as a form of negative or positive reinforcement depending on the group. This study, therefore, was done to establish the predictive validity of secondary school student's psychology and societal factors.

Purpose of the study

The main purpose of this study was to examine the influence of the psychological and societal factors on the students' achievement in mathematics and to access their relative importance in the prediction of student's success in mathematics. A good knowledge of the contribution of these variables on mathematics achievement will, therefore, guide educators on how to manipulate them to enhance students achievement.

Research Hypothesis

The following hypotheses guided the study

- i. Psychological factors have no significant effect on the academic performance of Senior Secondary School students in mathematics.**
- ii. Societal factors have no significant effect on the academic achievement of Senior Secondary School students in mathematics.**
- iii. Psychological factors and societal factors combined together have no significant effect on academic achievement of Senior Secondary School students in mathematics.**

Significance of the study

This study is significant to the teacher in determining the psychological and societal factors that influence a student's performance in mathematics. Thus, the factors can be improved in favour of the students. Students will also realize the factors that can contribute to their performance in mathematics. As a result of the study, parents will be able to develop a positive interest in mathematics. In the same way, school counsellors can use the study to advise the students how to improve their performance in mathematics. Educational planners can also use the study to develop the curriculum so as to improve the students' performance in mathematics.

Procedure

This research work targeted the senior secondary school students in Ilorin metropolis.

Ten secondary schools were randomly sampled from the target population. Then thirty students were randomly chosen from each school. Thus, a total of three hundred students were involved in the study.

Two instruments were employed in this study; these included a mathematics achievement test and a questionnaire set that was designed for the students. The test consisted of 50 multiple choice items which were designed to test student's mathematics comprehension of the topics they have been taught. The

questionnaire set was made up of two sections, A and B. Section A provided personal information about the respondents, while section B contained statements on psychological and societal problems of the study.

Data Analysis and Results

The data collected through the questionnaire and achievement test were analysed using Pearson product-moment correlation coefficient

Research Hypothesis One (HO1)

Psychological factors have no significance influence on the academic achievement of S.S.S. students in mathematics.

Table 1. Product moment correlation co-efficient analysis for influence of psychological factors.

	No. of Observations	Average	d.f	Cal. r_{12}	Critical Value $r_{298, 0.05}$
Psychological factors	300	2.596	298	0.9338	0.1288
Achievement test	300	47.917			

Significant at 0.05 α level

The Table 1 shows that the calculated $r(0.9338)$ is greater than $r_{298,0.05} (0.1288)$. Thus, hypothesis one is rejected. Therefore, psychological factors have significant influence on the academic achievement of S.S.S students in mathematics.

Research Hypothesis Two (HO2)

Societal factors have no significant influence on the academic achievement of S.S.S students in mathematics.

Table 2: Product-moment correlation analysis for influence of societal factors on students.

	No. of Observations	Average	d.f	Cal. r_{12}	Critical Value $r_{298, 0.05}$
Societal factors	300	2.175298	0.8977	0.1288	
Achievement test	300	47.917			

Significant at 0.05 α level

Table 2 shows that the calculated Pearson product moment correlation coefficient $r_{13} = 0.8977$ which is greater than table value. Thus, hypothesis two is rejected. Therefore, it is concluded that societal factors have a significant influence on academic achievement of S.S.S students in mathematics.

Research Hypothesis (HO3)

Psychological factors and societal factors combined together have no significant influence on academic achievement of S.S.S students in mathematics.

Table 3: Multiple correlation coefficient for influence of psychological factors and societal factors combined together on students.

Multiple correlation between academic achievement and	Value of R	Significance of correlation
Psychological factors and societal	$R_{1,23} = 0.9506$	Significant

Table 3 shows the multiple correlation between academic achievement in mathematics and psychological factors and societal factors using equation 1.2 (appendix 1). It can be seen that the correlation is significant at 0.05 using equation 1.4 (Appendix 1).

Table 4: Partial correlation co-efficient between academic achievement in mathematics and psychological factors keeping the effect of societal factors constant (see Appendix 1)

	Residual	Ratio of residual to the original	Significance of correlation
Effects of societal factors removed			
Academic Achievement and Psychological Factors $r_{12.3}$			
	0.8634	0.9246	Significant

Table 4 shows that the co-efficient of partial correlation between performance in academic achievement and psychological factors keeping the effect of societal factors constant using equation 1.3 (Appendix 1), which was found to be positively significant using equation 1.5 (Appendix 1)

Table 5: Partial correlation co-efficient between academic achievement in mathematics and societal factors keeping the effect of psychological factors constant (see Appendix 1)

	Residual	Ratio of residual to the original	Significance of correlation
Effects of societal factors removed			
Academic Achievement and Societal factors $r_{13.2}$			
	0.7824	0.8718	Significant

Table 5 shows the coefficient of partial correlation between performance in academic achievement and societal factors keeping the effect of psychological factors constant using equation 1.3 (Appendix 1). It was found to be positively significant using equation 1.5 (Appendix 1)

Discussions of results

The results in tables 1 and 2 show that psychological factors play a greater role in academic achievement of S.S.S students in mathematics, than societal factors. This is expected because mathematics is more mental work though influence of societal factors is also significant (Table 2). The result on table 3 shows a high significance of multiple correlations between academic achievement in mathematics and psychological factors and societal factors combined.

The results in table 3 also support the earlier findings by Adegboye (Jnr) and Adegboye (2003), that there is a positive significant correlation between performance in mathematics and some selected factors (both psychological and societal factors). Similarly, Olubodu (1991) argues that peer interaction and student-teacher contact and rapport (both societal factors) have a significant effect on students achievement in mathematics, Umoinyan (1997) also backs the finding in table 2 that anxiety and other psychological factors have an effect on academic achievement of students in mathematics.

In table 4, the fall in correlation between academic achievement in mathematics and psychological factors when the effect of societal factor is removed is just 7.5% of the original value. In table 5 the fall in correlation between academic achievement and societal factors when the effect of psychological factors is removed is 12% of the original value. This shows that people's mind and thoughts play a much greater part in mathematics than their social environment. Nonetheless, each of the correlation is found to be significant.

Conclusions

In this study, an attempt has been made to identify psychological factors which can be manipulated to enhance student's high achievement in mathematics. Based on the findings of this study, the following conclusions can be reached:

1. That both the psychological factors and societal have a combined influence on the academic achievement of students in mathematics.
2. The effect of psychological factor is more pronounced than that of societal factors.
3. Academic achievement in mathematics depends on mental drilling. These findings tend to lend support to the call to improve student's mental fitness.

It can be concluded that many students in Nigeria and Ilorin metropolis in particular are affected by these factors.

Recommendation

In the light of the results obtained, the following recommendations are important:

Teachers should have professional qualifications which enable them to study psychological problems in class. Teachers should, as much as possible, try to reduce the anxiety level of students. As much as possible, the examination atmosphere should be free from disturbance, as recall requires a calm and quiet environment. Therefore, the teacher of mathematics should reorganise the students and teach with the above premises in mind. He/she should try to inspire and promote student interest in mathematics and use positive rather than negative reinforcement.

Above all it is important for the school counsellors to monitor what goes on in the home with a view to providing students with learning experiences commensurate with their circumstances. It is believed that the suggestions presented in this study could be implemented with minimal financial input and would reverse the parlous state of student's under-achievement in mathematics in Nigeria.

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APPENDIX I

(a) Analysis of Data

Let X_1 , X_2 and X_3 be the grade vectors of academic achievement of students in mathematics, psychological factors and societal factors respectively. To simplify the notation, a subscript will refer to a particular variable, with 1 referring to X_1 and 2, 3 referring to X_2 , X_3 respectively. Thus r_{12} is the sample correlation co-efficient of X_1 and X_2 , r_{13} is the coefficient of linear correlation between X_1 and X_3

A multiple correlation of linear correlation between academic achievement (Y) and psychological factors (X_2) and societal factors (X_3) given as

$$R_{1,23} = \frac{\sqrt{r_{12}^2 + r_{13}^2 - 2r_{12}r_{13}r_{23}}}{\sqrt{1 - r_{23}^2}} \dots\dots\dots 1.2$$

(Spiegel 1972)

The correlation between a dependent variable and one particular independent variables can be measured when all other variables involved are kept constant by using residual correlation between Y and X2 keeping X3 constant is given by (Spiegel 1972) as

$$r_{12} = \frac{r_{12} - r_{13}r_{23}}{\sqrt{(1 - r_{13}^2)(1 - r_{23}^2)}} \dots\dots\dots 1.3$$

(b) Testing of Hypothesis

The co-efficient of multiple — residual correlation between the academic performance students at S.S.S level and psychological and societal factors and other residuals as discussed in charter four are calculated using the equations in section (a) of this appendix.

The calculated co-efficient were tested for significance at the 0.05 level.

The Pearson product-moment correlation co-efficient (r_{ij}) was tested with 298 degrees of freedom of products moment correlation co-efficient, (Adegboye, J. S and Ipinoyomi, R. A (1995).

The test statistics for multiple correlation co-efficient is

$$F = \frac{R^2}{1 - R^2} \times \frac{(N - K - 1)}{K} \dots\dots\dots 1.4$$

Where R is the calculated multiple correlation

The test statistics for partial correlation is given by

$$F = \frac{r^2_{12,3}}{1 - r^2_{12,3}} \times \frac{(N - K - 1)}{K - 1} \dots\dots\dots 1.5$$

(Spiegel 1980)

The ratio of residual correlation were calculated with the effect of societal factors was removed, that is the ratio of the correlation between academic achievement and psychological factors, eliminating the effect of societal factors (0.8634) to the correlation between performances in mathematics and psychological factors (0.9338) is given by

$$r_{12,3} = \frac{0.8634}{r_{12} 0.9338} = 0.9246$$

(see table 4.6)

APPENDIX II**Questionnaire**

The questionnaire is seeking information about the influence of psychology and societal factors on students' performance in mathematics at Senior Secondary level. The given information will be treated confidentially and only for the purpose of this study. The researcher will be very grateful if you can answer the questions objectively.

Tick (✓) which ever is applicable please

SECTION A

School:

Rating keys:	0	Never
	1	Rarely
	2	Sometimes
	3	Frequently
	4	Always

SN- Psychological factors	Never (0)	Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
1. <u>Anxiety level</u> of students influences his performance in mathematics					
2. <u>Aspiration</u> of students to be successful in mathematics					
3. <u>Encouragement</u> received by students produced good performance in mathematics					
4. <u>Feed back</u> improves students performance in mathematics					
5. <u>Incentives</u> to students contributes to his performance in mathematics					
6. <u>Interest</u> in mathematics makes students to pass the subject					
7. <u>Personality trait</u> of parent helps the students' performance in mathematics					
8. <u>Physical health</u> has roles to play on students' performance in mathematics					
9. <u>Student maturity level</u> influences his/her performance in mathematics					
10. <u>Motivation</u> from teacher improves students' performance in mathematics					

S/N	Societal factors	Never (0)	Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
1	<u>School environment</u> has an influence on students' performance in mathematics					
2	<u>Home infection</u> makes students to pass mathematics exams					
3	<u>Parental social status</u> contributes to student's performance in mathematics					
4	<u>Peer group</u> influences student's performance in mathematics					
5	<u>Societal value</u> contributes to student's performance in mathematics					
6	<u>Students social activity</u> Influences his/her performance in mathematics					
7	<u>Achievement of siblings</u> encourages his brothers/sisters to pass mathematics					
8	<u>School interaction</u> is a factor contributing to student's performance in mathematics					
9	<u>Siblings interaction</u> helps student's improvement in mathematics					
10	<u>Urban rural</u> setting significantly influences student's performance in mathematics					



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