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MOTIVATION, GENDER-TYPING, LEARNED HELPLESSNESS AND PERFORMANCE IN 2015 JSCE MATHEMATICS BY JC STUDENTS IN GABORONE

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Abstract

At an age when there is a survival-threatening need for Africa to catch up with technology-driven global development, performance by our learners in the very subject that underwrites such development is alarmingly poor. In Botswana, as in all countries in sub-Saharan Africa, performance in mathematics by primary through secondary school learners is poor and has been deteriorating. This affects ability of secondary education to supply candidates to fill admission vacancies in engineering, medicine, and all other science-related programmes in the tertiary level, and for those admitted to do well or complete such programmes. To contribute a possible solution to this problem, a survey inferential study using a validated 6-point Likert scale questionnaire was undertaken. A t-test and an ANOVA analyses of survey and final examination data from 733 students from five randomly selected junior secondary schools in Gaborone showed that students were significantly poorly motivated when taking the final JSCE examination in mathematics, significantly gender-typed the subject and were significantly learned-helpless in their encounter with the subject. The level to which the students were poorly motivated had significant influence on their expected and actual performance as well as on their levels of gender-typing the subject and their level of learned helplessness in the subject. These findings were discussed and recommendations that followed from the findings are made.
***Keywords**: motivation; expected performance; actual performance; mathematics, gender-typing; learned helplessness; JSCE; Gaborone; Botswana*

Introduction

Poor and deteriorating performance among learners in mathematics is cancerous to the development of any nation. Yet in many African nations, governments, parents, teachers, and the society generally tend not to give this problem the importance it deserves. Like in any other country, according to Botswana Minister of Education Skills Development, Dr Venson-Moitoi, during the official opening of Mathematical Association of Botswana (MAB) annual general conference in Gaborone in 14 May 2014, mathematics and science are important aspects for the development and progression of the country. She further emphasized its significance as central to learning in all aspects of life such as reasoning, order and sequence (Nkwe, 2014). To specify its importance it is a compulsory subject in all levels right from primary up to secondary schools in Botswana. Even though it is seen as a basic entry requirement for any science-related fields such as medicine or engineering in institutions of higher learning learners still perform very poorly in this subject. Therefore

establishing the relationship between motivation, expected and actual performance in mathematics among secondary school students is very pivotal.

Unlike the several discriminating African languages, mathematics as the language of intellectual and scientific communication, cuts across cultures, languages and religions. According to Annenberg Foundation (2017), mathematics is the only language shared by all human beings regardless of culture, religion, or gender. . . . Adding up the cost of a basket full of groceries involves the same math process regardless of whether the total is expressed in dollars, rubles, or yen. With this universal language, all of us, no matter what our unit of exchange, are likely to arrive at math results the same way. Very few people, if any, are literate in all the world's tongues—English, Chinese, Arabic, Bengali, and so on. But virtually all of us possess the ability to be "literate" in the shared language of math (p. 1).

Socialization underlies the development of much of the learners' behavior towards mathematics. Parents, siblings, peers, mass media and individuals with whom children have socializing interactions early in life consciously and unconsciously create a social, motivational and cognitive or psychological environment within which the child grows. In many aspects of growth and development, a child can rarely grow beyond the limits placed by such environment. Such is an environment created by parental, siblings, peers, mass media and societal influences for the growth and development of mathematics-related behaviour. Through these agents, consciously or unconsciously, few children are socialized into favuourble disposition towards mathematics, while most are socialized into unfavourable disposition towards the subject. Hence it is strongly believed that the society is to blame for children's unfavourable mathematics-related behaviour.

A case in point is the gender-typing of mathematics as a male-only subject. Children were not born with this behaviour but learned it through the culture-based socialization process. The society raises boys and girls to exhibit differences in behavior according to their expected roles. Gender roles are a set of behaviours perculialized for males and females by and in the society which demands or encourages them to exhibit as expected. For example, 'hardy' tasks are ascribed mainly for males while 'pleasant' ones are mainly for females. When it comes to mathematics as a subject which has been classified as being difficult the society's syllogistic argument is:

difficult tasks are meant for males only;
mathematics is a difficult task;
therefore mathematics is meant for males only.

Since both the major and minor premises are false the conclusion cannot be valid.
If repeated encounter with a task deemed to be important does not result in success, but in persistent failures, anxiety and demotivation tend to set in. Several of such experiences across time tend to provoke the sense of helplessness or powerlessness earned from persistence failure over a set of mandatory tasks. In mathematics such experiences constitute 'death at an early age' (Kozol, 1967) for especially primary school children. In

the words of Crawford (2016, p. 5) "No one knows the exact time when math first began to terrorize our nation, but research discovered that this deep societal fear of math is passed along, though not genetically, from one generation to the next". This type of thinking underlies Tobias' (1995) advice that "there is a lot of unlearning to do"; and "mathematics avoidance is not a failure of intellect, but a failure of nerve".

Theoretical Background

Motivation

The study will be guided by the social exchange theory and reinforcement theory as the basis for establishing the influence of motivation on some emotional- and cognitive-related behavior among junior secondary students in Gaborone. Harackiewicz, Barron, Elliot and Lehto (1997) refer to motivation as the driving force behind all the individuals' actions. This may be interpreted as that necessary for students to participate and perform well mathematics. it is important to note that 'their hard work is paid off to keep them focused on aiming high. Student's willingness to achieve and excel depends largely on the way they are motivated (Ali, Tatlah & Saeed, 2011, p. 30).

Social exchange theory is not a theory but rather a frame of reference within which many theories can relate to each other (Emerson, 1976). It is based on utilitarianism thinking which is built on the assumption of individual self-interest. Hence, to understand an individual's actions is to understand the individual's interest or values. The main focus of this theory is on motivation. The motivation is what induces a person to act and propels a person to choose a particular action. This is a psychosocial perspective which explains social exchange and stability as a process of negotiated exchange between parties. The theory posits that all human relations are formed by the use of subjective cost-benefit analysis and that the level of a person's satisfaction is determined by the on-going rational evaluation of the costs and benefits of a relationship. It is based on the value for reciprocracy which argues that people expect something in exchange for a favour of something worth that they have given out and when they receive satisfactory rewards they then have obligation to reciprocate in response to the reward (Guttman, 1993). This is true especially in education. If students are given rewards they can exceptionally perform well in school. Social exchange is seen as the exchange of activity, tangible or intangible, and more or less rewarding or costly, between at least two persons' (Homans, 1961, p. 13).

The other motivation theory employed for this study is the reinforcement theory. This theory suggests that people display certain behaviour in achievement or other settings because they have been rewarded for that behaviour in the past. Therefore this means that positive reinforcement stimulates occurrence of a behaviour especially giving rewards. This implies that given a positive response, an individual will display positive and needed behaviour.

We consciously or unconsciously act or behave as expected of our kind by the society or exhibit behavior in consonance with cultural expectations. Since we differ in the way we interpret the cultural expectation of our kind, stereotyping is a behavioral variable, and

gender-typing is one of the society's expectation-driven behaviour. This thinking is implied in Bem (1981)'s gender schema theory which holds that children learn and behaves to suit what it takes to be a boy or a girl as taught and expected by the culture under which they grow.

Gender-typing

By creating people male and female, nature manipulates human and imbibes them with characteristics, traits and behavior which, in most cases, are different. Biological differences between males and females have provoked several behaviour-related theories. These include theories related to gender-roles. These are differentiating behaviours, obligations and responsibilities expected of males and females. As members of a gender group we are expected to act alike or toe the same line of behaviour, different from members of the other gender group. Behaviour are used to identify or discriminate between groups rather than discriminating based on individual behaviour.

Sex-typing is the tendency to categorize men and women based on some shared traits. In most cultures, for example, women are considered to be pleasant, sensitive, weak and dependent, while men are associated with the traits of hardiness, adventurous and determined. To Freud's psycho-analytical theory gender-typing is a natural process due to biological differences of males and females while social learning theory, emphasizes that social stereotypes, cultural norms and agents of socialization (families, peers, teachers and institutions) consciously and unconsciously play important roles in the development of gender identity and sex-typing. cognitive development theory, on the other hand, views sex identity as non-imitative learning facilitated by people around the child, and by the age of 6 the child has developed permanent cognitive category for his/herself as being male or female (Virtual University of Pakistan, n. d.).

Learned helplessness

The concept of "learned helplessness" resulted from an investigation by Martin Seligman (Seligman, 1972) on negative reinforcement. The dog with which he was conducting the experiment learned that it does not have any control over a hurting situation, and that whatever it does – or does not do – will not have any effect on the outcome. It was totally unable to control what was happening to it. What it learned, as a result, was that any action by it had no effects and that therefore it was helpless. The theory has been researched on human and shown to be related to many educational problems. According to Seligman,

The only way to help people who suffer 'learned helplessness' depression, . . . is to concentrate on showing the depressive person that he can operate on his environment and be effectual – perhaps by giving him simple tasks in therapy at which he can succeed, develop confidence and then move on to harder ones (Seligman, 1972, p. 408)

In African primary and secondary schools, if mathematics as a subject was not made compulsory, mathematics classrooms would be almost empty. Under the mandatory condition, in mathematics classrooms learners learn to accept and endure unpleasant cognitive stimuli, as these are unavoidable. Repeated failure during the interaction with

such stimuli provokes a feeling of depression with a persistently failing behavior of a defeated mind. Mathematics attracts learned helplessness among students more than any other school subject (Yates, 2009).

According to Verma and Gera (2012, p. 3), the symptoms of learned helplessness in any subject include:

- low cognitive efforts in the subject;
- low self-confidence in their own skills;
- inability to take initiatives;
- extreme negativism;
- withdrawal and social isolation;
- low basic drives;
- low motivation to learn;
- low self-esteem; and
- poor coping skills.

Statement of the Problem and Purpose of the Study

In Africa, government, parents, teachers and the society generally tend to lack the skill to motivate improved performance in mathematics among their wards. Hence, in Botswana, like in all countries in sub-Saharan Africa, performance in mathematics by primary through secondary school learners has been deteriorating. This is a problem of highest importance given the place of mathematics in development of science and engineering in a world driven by technology. Motivation has been seen as a driving force which influences good performance among learners. Therefore lack of motivation in mathematics lessons is leading to significantly lower expectation as well as actual performance in the subject. The process through which young ones are socialized tend to gender-type mathematics as a male-only subject, and yet in Botswana, males are not performing significantly better than females in the subject. Lack of motivation and persistent failing performance in the subject tends to 'take the wind of the wings' of learners' effort at gainfully interacting with mathematics tasks and hence they tend to withdraw effort and learn to become helpless in the face of such tasks.

To anybody that realizes and cares about the importance of mathematics as a fundamental language of science and technology which are the drivers of progress and development in the world of today, a study like this is very crucial and should be encouraged. The purpose of this study is to determine the extent to which the 2015 final year students in Gaborone were motivated to do well in their JSCE examination in mathematics and also determined the extent to which they gender-type and have learned to be helpless when it comes to mathematics. It will also determine the level to which these variables predict actual 2015 JSCE examination performance in the subject, as well as how they differ across different levels of motivation in the subject.

Research Hypotheses

1. JS3 students in Gaborone who took the 2015 JSCE mathematics examination were significantly motivated to perform well in the 2015 JSCE mathematics examination; were significantly learned-helpless given their experience with mathematics; and significantly gender-type mathematics as a male subject.
2. Among Gaborone JSS students, level to which mathematics is gender-typed as a male subject (GTMS), and their level of learned helplessness (LLHM) significantly predict their actual performance in 2015 JSCE mathematics.
3. Motivation to perform well in mathematics by JS3 Students in Gaborone has significant influence on the score they expected, the grade the actually made during the 2015 JSCE examination in the subject, as well as on their LLHM and GTMS.

Review of Literature

Motivation to perform well in mathematics

With a sample of 450, Tella (2007) undertook a survey study to determine the impact of students' motivation on the performance on mathematics among Nigerian senior secondary school students. The findings showed that there was a significant relationship between the extent of motivation and interest on academic achievement in mathematics. It further showed that gender difference was substantial when impact of motivation on achievement was compared between male and female students.

Similarly, Newman (2009) also in her study of motivating student learning in the middle school classroom, sampled 59 students of 12-13 years old. The research found that students were motivated by different motivational strategies in their learning of mathematics such as time on task, homework completion, overall grades, behavior, group work and comments. The study further showed that the use of multiple strategies at the same time increase student's motivation level of the students.

Mbugua, Kibet, Muthaa and Nkoke (2012) investigated factors that contribute to the poor performance of mathematics in Kenya and strategies that can improve the performance. Mbugua and colleagues in their descriptive survey research found that staffing, inadequate teaching and learning materials, lack of motivation, poor attitudes by both teachers and students were factors contributing to poor performance in mathematics. The study also established ways that can improve the performance of mathematics and were groups into 5 categories comprising of a) staffing b) teaching and learning materials c) curriculum d) motivation and attitudes and e) fees and levies.

Rudhumbu (2014) through his structured questionnaire study explored the concept of motivational strategies and how they can apply to the teaching of mathematics in Zimbabwean primary schools. The strategies were conveying confidence, conveying high aspirations, giving comments and valuing tasks. His findings revealed that although it is essential to motivate students to learn mathematics, primary mathematics teachers due to workloads and huge classes are unable to use motivational strategies in their teaching on a regular basis. In Australia, Nielsen and Moore's (2003) findings revealed that ninth grade

students mathematics self-efficacy scores were considerably and positively connected to their previous year's mathematics scores. In India, the relationship between intrinsic and extrinsic motivation on academic performance of 200 college students were established. The results also revealed that there is a relationship between motivation and academic performance (Ayub, 2000).

Also, Adams and Pierce (2013) noted strategies that can improve student's motivation in the learning environment for purposes of attainment of high results. The researchers mentioned that learner's self-esteem through praising, maintaining eye contact, smiling and actively listening, and knowing students personally by teachers as to have a robust influence on motivation. Eggleton (as cited in Michelli, 2013) corroborates with this view by stating that motivation through smiling, giving extra help on given tasks or commending the students for doing well could be employed by teachers as great motivators to improve students' performance. This would mean that if some of the strategies are employed during mathematics lessons students' performance would improve as well.

Ali, Tatlah and Saeed (2011) in their study established the motivation and student's behaviour at tertiary level. Interestingly, the study found that there is a significant relationship between positive motivation and students' behaviour. one of the factors that affect student motivation is the extent to which students are given rewards which can be in various forms such as encouragement, permitting the students to show their creative skills, appreciating the students good performance The findings revealed that if students are motivated through giving rewards they have positive attitude towards the subject and they perform better.

Motivation has been seen as related to actual achievement performance. Atkinson (as cited in Tella, 2007) noted that 'Individuals' actual achievement behaviour depends not only on their motivation to achieve but also on whether they expect to achieve and whether they fear failure. People are more likely to work hard when they perceive a reasonable chance to succeed than when they perceive a goal to be out of reach (p. 152). According to Zimmerman (2000, cited in Smetackova, 2015), previous studies have showed that school achievements depend on students´ motivation and identification.

Motivation tends to drive expectation in task performance (Lee, Meletiou, Wachtel, & Zeleke, 2002). These researchers investigated student motivations and expectations before taking their introductory statistics course. The study unearthed the following student motivations and categorized them as goal oriented, career related, value oriented, self-motivated, social environmental oriented and external forces oriented. The findings revealed that self-motivated learners, have a desire to participate in classroom lessons. The social environmental related motivations were also revealed as good students' motivators. Students' motivation in this regard was found to be highly influenced by teachers' interaction with the students during lessons.

Gender-typing and Mathematic Performance

Nenty (2000), with a random sample of 716 Form D junior school students from Lesotho, carried out an exploratory survey study designed to determine the influence of gender-typing of mathematics on learners mathematics-related behaviour. Survey data, as well as Junior Certificate (JC) examination results of the students were analysed using chi-square (□2), and two-way ANOVA statistics. The results showed that there is a significant ($p < .02$) sex influence on gender-typing of mathematics, gender-typing among secondary school students in Lesotho has significant influence on almost all the eight mathematics-related variables under study as well as on their performance in the subject (Nenty, 2000).

Similarly, through a survey inferential study of 442 randomly selected girls from Lesotho junior secondary schools, Nenty (2008) found that at this age, girls had low but significant level of endorsement of mathematics as a male-only subject. Such level of endorsement was found to relate significantly to their performance attribution pattern, their actual performance in mathematics, as well as to several of their other mathematics-related behaviours.

Through a study involving 436 boys and girls divided into two age groups – 10 or 11 years old and 14 or 15 years old in Czech Republic, Smetackova (2015) showed that boys and girls had non-significantly different test scores in mathematics and showed similar identification with the subject. Gender-typing mathematics was significant and got grew more significant for boys and the 14-15 years group. As children get older, and groups got more heterogeneous, differences between boys and girls increase within each group. But in general, the relationship between performance, beliefs and gender-typing was low, except for the group of older boys.

Learned Helplessness and Academic Performance

Nenty and Ogwu (2009) examined the hypotheses that gender and level of learned helplessness (LLH) significantly influences mathematics-related behaviour of and hence the performance by students in senior secondary schools in the Kingdom of Lesotho. Some 310 students from 12 randomly selected senior secondary schools completed questionnaires assessing their level of LLH and some other mathematics-related affective variables. Two-way ANOVA indicated that gender and the level of LLH in mathematics significantly influences students' attitude towards mathematics. Students with high LLH showed poor attitude towards mathematics, attach less value to mathematics and have high tendency to cheat in mathematics exam. However, students with low LLH showed more positive attitude and value towards mathematics and a low tendency to cheat during mathematics examination.

Yates (2009) analyzing data collected in the last term of the school year when most teachers had established some level of familiarity with students' customary behaviours exhibited during mathematics lessons, showed that students' reaction to failure and lack of motivation were the most salient behavioural characteristics of learned helplessness. Given that the items used in the 'Student Behaviour Scale' used in the study, "clearly relate to the

manner in which students responded to mathematics tasks and activities set by classroom teachers. It is therefore likely that these achievement related behaviours influenced students' actual achievement in mathematics, thus creating a vicious circle in which helplessness and lack of achievement were inextricably intertwined" (p. 100).

Methodology and Research Design

A positivist-backed quantitative inferential survey design was used for this study. Seven hundred and thirty six Form 3 junior secondary school students from five randomly drawn junior secondary schools in Gaborone served as the subjects of the study. The sample included both male (n = 298) and female (n = 438) students. These were students who were preparing to take their final junior secondary school examination (JSCE) in mathematics in two weeks' time. Permissions were secured from the office of educational research of Botswana Ministry of Education and Skill Development (MoESD). Permission to take part in the study was also solicited from the parents and those who approved did so through signing a consent form. Although we had a lot of participants willing to participate, those that did not want were not forced. The students also completed subjects' consent form. Finally with the letter of permission issued by the MoESD, the principals of the five sampled schools were approached and their permission also secured (Nenty, Kgosidialwa, & Moeti, 2017).

A questionnaire was the main instrument for data collection. This comprised of four sections. The first section requested for demographic information from the subjects through items asking for data on gender, age, name of school, socio-economic status, etc. They were also requested to indicate their identification number in the forthcoming final examination. The second section contained 30 6-point Likert-type items developed to measure six variables including 'motivation to perform well in the forthcoming JCSE examination in mathematics'; 'level of gender-typing of mathematics as a male subject'; and 'level of learned helplessness experienced by the students in mathematics'; the items. The 6-point response options ranged from strongly agree to strongly disagree.

The third section of the questionnaire ask questions related to attribution of performance in mathematics, and their expected performance in mathematics in the forthcoming final examination. While the last section presented a sketch of a classroom seating arrangement with 36 seats. They were asked to indicate on which seat they would like to occupy if they were free to sit where they liked in a mathematics classroom.

With the help of teachers in the schools a total of 800 two pages questionnaires were distributed and administered by the researcher in all the schools on different dates. Instruction on how to fill in the questionnaires were read and explained to the participants to ensure proper understanding and completion of the questionnaire. The questionnaires were retrieved from the participant's immediately after administration. The data collection took place mostly during the afternoon and took a total of about forty minutes to an hour. Hence as examinations were approaching much time was not demanded of the participants

in completing the instrument. Data collection process lasted for two weeks and the responses in the schools were satisfactory with a return rate of 92%.

Data Analysis – Results and Interpretations

All the hypotheses were tested at the .05 level of significance.

Null Hypothesis I

JS3 students in Gaborone who took the 2015 JSCE mathematics examination:

- *were not significantly motivated to perform well in the 2015 JSCE mathematics examination;*
- *did not reach a significant level of learned helplessness in their experience with mathematics; and*
- *did not significantly gender-type mathematics as a male subject.*

This hypothesis was tested by carrying out three population t-test analyses of 2015 JS3 students' responses to (i) an item "motivation to perform well in mathematics during the forthcoming JSCE final examination" designed to measure the level to which students were motivated to perform well in final examination in mathematics; (ii) level of learned-helplessness in their experiences with mathematics; and (iii) the level to which they gender-type mathematics as a male subject. Given the 6-option item, the expected mean was determined to be 3.50 per item. For each of the three variables, using SPSS computer package, the analysis statistically compared the expected score to the observed mean score as presented in Table 1.

For level of motivation, this resulted in a negative t-value of -12.94 which was found to be significant at beyond .05 alpha level. This observation led to the rejection of the null hypothesis. Given the negative t-value, this means that JS3 students in Gaborone were significantly not motivated to perform well in the 2015 JSCE mathematics examination. So they went into the examination significantly unmotivated to perform well in the subject. For level of learned-helplessness given their experience with mathematics, the t-value obtained was 20.81 which was found to be a lot higher than the critical t-value of 1.96, hence the null hypothesis was rejected. This means that JS3 students in Gaborone who took their final examination in 2015 had learned to feel significantly helpless when it came to their experience with mathematics. Similarly, with gender-typing of mathematics as a male subject, the analysis gave a t-value of 48.21 which was found to be a lot higher than the critical t-value ($t = 1.96$, $df = 741$, $\alpha = .05$), hence the null hypothesis was rejected. Meaning that, JS3 students in Gaborone who took the 2015 JSCE mathematics significantly stereotyped mathematics as a male subject.

Table 1
Population t-Test Analysis of the Significance of Gaborone JS3 Students' Motivation to Perform Well in 2015 JS Final Examination Mathematics (df = 741)

Variable	μ	$\overline{X}$	SD	SE	Mean Diff.	t-value	p <
Motivation to Perform well in Mathematics during 2015 JS3 final/examination	3.50	2.31	1.24	.046	-1.19	-12.94	.000
Level of Learned Helplessness in Mathematics	17.50	21.13	4.49	.174	3.63	20.81	.000
Level to which mathematics is Gender-typed as a Male Subject	7.00	10.46	1.92	.071	3.46	48.21	.000

*p < .05; **p < .01 (2-tailed).

Null Hypothesis II
Among Gaborone JSS students, level to which mathematics is gender-typed as a male subject (GTMS), and their level of learned helplessness (LLHM) do not significant predict their actual performance in 2015 JSCE mathematics.

This hypothesis was tested by carrying out a multiple regression analysis of actual performance in 2015 JSCE mathematics using GTMS and LLHM as the two independent variables. As presented in Table 2, the two predictors correlated -.253 and -.509 respectively with the performance, and in combination gave an R-value of .530 (Adjusted R2 = .278) with it. In other words, GTMS and LLHM both accounted for 27.80% of the variability in the students' actual performance in 2015 JSCE mathematics. Through a step-wise multiple regression, it was found that learned helplessness alone which relates r = -.509 with actual performance accounts for 27.30% of the variance of the actual performance in 2015 JSCE mathematics.

Table 2
Prediction of Actual Performance in 2015 JSCE Mathematics using GTMS and LLHM as Predictors

#	Variable	1	2	3	4
1.	Expected Performance in Maths Before Exams	1.00	-.459**	.499**	.118*
2.	Actual 2015 JSCE grade in Mathematics	-.459**	1.00	-.509**	-.253**
3	Level of Learned Helplessness	.499**	-.509**	1.00	.338**
4.	Level of Gender-typing Mathematics as Male subject	.118*	-.253**	.338**	1.00

R	R-Square	Adjusted R Square	SE_e	df_1	df_2	F	Sig
.530	.281	.278	8.438	2	512	100.14	.000[a]

Source of Variation	Sum of Squares	df	MS	F-value	
Regression	14261.484	2	7130.742	100.141	.000[b]
Residual	36458.104	512	71.207		
Total	50719.588	514			

Constant/Variable	B-weight	SE	β	t-value	Sig
(Constant)	76.899	2.343		32.827	.000
Gender-typing of mathematics as a male subject	-.450	.207	-.086	-2.171	.030
Learned Helplessness	-1.051	.084	-.496	-12.490	.000

*p < .05; **p < .01

Null Hypothesis III
Motivation to perform well in mathematics by JS3 Students in Gaborone has no significant influence on the score they expect, the grade the actually made during the 2015 JSCE examination in the subject, LLHM and GTMS.

To test this hypothesis four one-way analysis of variance (ANOVA) were carried out to determine the extent to which level of motivation influences students' grade expectation and actual performance during the 2015 JSCE final examination in mathematics (see Table

3). For scores they expected just before they took the examination, the analysis gave an F-value of 55.69 with 2 and 688 degrees of freedom. This was found to indicate significant influence at beyond the .01 alpha level. So the null hypothesis was rejected. Similarly, for their real performance in grade, the F-value was found to be 21.56 which again, with 2 and 554 degrees of freedom was found to be significant at beyond the .01 alpha level. Hence the null hypothesis was also rejected for their actual performance in mathematics. In other words, the level to which 2015 JS3 students were motivated to perform in JSCE mathematics examination had significant influence on their expectation and actual performance in their final JSCE examination in mathematics.

For level of learned-helplessness (LLHM), the F-value came out to be 40.20 which was observed to be higher than 3.86 the F-value needed for significance at .05 level. Hence the related null hypothesis was rejected. In other words, the level to which JS3 students in Gaborone were motivated to perform well in the 2015 final examination in mathematics has significant influence on the level to which their past experiences with mathematics has taught them to be helpless when it comes to their interaction with the subject. Similarly, for level to which mathematics is stereotyped as a male subject, the observed F-value was 24.51 which is bigger than the critical F-vale of 3.36 ($df = 2, 715, \alpha = .05$). This led to the rejection of the null hypothesis. Hence, the extent to which JS3 students in Gaborone were motivated to perform well in the 2015 final examination in mathematics has significant influence on the level to which their past experiences with mathematics has 'taught' them to be helpless when it comes to their interaction with the subject.

Table 3: *One-way Analysis of Variance (ANOVA) of the Influence of Level of Motivation (LoM) on Expected and Actual Performance in 2015 JSCE Mathematics Examination in Gaborone.*

Variable	LoM	n	$\bar{X}$	SD	SE	Source of Variation	SS	df	MS	F	Sig.
Expected Performance before JS3 2015 final Exams.	High	82	44.25	12.47	1.38	Between Groups	9612.12	2	4806.56	55.69	.000
	Average	265	47.04	8.35	0.52						
	Low	344	53.65	9.10	0.49	Within Groups	59382.64	688	86.31		
	Total	691	50.00	10.00	0.38						
						Total	68995.75	690			
Actual Performance During JS3 2015 final Exams.	High	66	55.27	8.50	1.05	Between Groups	4013.94	2	2006.97	21.56	.000
	Average	215	51.57	10.15	0.69						
	Low	276	47.56	9.50	0.57	Within Groups	51577.50	554	93.10		
	Total	557	50.02	10.00	0.42						

						Total	55591.44	556			
Level of Learned helplessness in Mathematics (LLHM)	High	82	18.60	4.53	0.50	Between Group	1519.01	2	759.51	40.20	.000
	Average	262	20.06	3.99	0.25						
	Low	347	22.54	4.55	0.24	Within Group	12998.01	688	18.89		
	Total	691	21.13	4.59	0.17	Total	14517.02	690			
Level of Gender-typing Mathematics as a Male-Subject (GTMS)	High	87	9.94	2.15	0.23	Between Group	169.40	2	84.70	24.51	.000
	Average	277	9.99	1.88	0.11						
	Low	354	10.95	1.77	0.09	Within Group	2470.77	715			
	Total	718	10.46	1.91	0.72	Total	2640.16	717			

Effect sizes for: Expected Performance = .139; Actual Performance = .072, Learned helplessness = .105; Gender-typing = .064

A close look at the presentation on Table 3 shows that for both expected and actual performance during the final examination, the higher the level of motivation, the higher the performance in mathematics tends to be. When this trend was tested statistically using Fisher's least significance difference (LSD) test, it was found that for expected performance, students high level of motivation tended to expected significantly less score than those with low level of motivation. This trend was reversed for actual performance in the JS3 final examination in the subject. For the two affective variables LLHM and GTMS, the post-hoc Fishers' LSD analysis showed that students at the low level of motivation exhibited significantly higher level of gender-typing and learned-helplessness than those with high level of motivation.

Summary of Findings

The study found that JS3 students in Gaborone who took the 2015 JSCE mathematics examination were not significantly motivated to perform well in the 2015 JSCE mathematics examination, and given their previous experiences with the subject, they saw themselves as being significantly helpless during their interaction with the subject during the examination. To a significant level, they also perceived mathematics as a male subject, and such view related significantly negatively with their actual performance in the subject.

The level to which the students have learned through experience to be helpless when it comes to mathematics was found to account for 27.30% of the variability of their 2015 JSC examination performance in the subject and along with the level to which they perceived the subject as a male subject it accounted for a total of 27.80% of such variance.

The level to which the students were motivated to perform well in the 2015 JSCE mathematics examination was found to have significant influence on the scores they expected and the grade they actually made during the 2015 JSCE examination in the subject, as well as on the level to which the students had learned, based on their previous failing experiences with mathematics, to be helpless during their interaction with the subject examination items, and the level to which they gender-type mathematics as a male subject.

Discussion, Implications and Recommendations

Motivation is the driving force that energizes persistence in action and often leads to successful performance. When there is motivation one tends to try until success. Gaborone students who were about to take their final junior secondary school certificate examination in 2015 in mathematics were found to have been significantly unmotivated, exhibited significant level of learned helplessness, and significantly gender-typed the subject as a male subject. Even if he/she has enough ability, a child that is significantly infected by these three powerful emotional behaviours is very unlikely to muster enough cognitive prowess to tackle the challenges posed by the demands of mathematics examination items. Lack of motivation tend to deflate one's ego in tackling life challenges, gender–typing a task tends to provoke stereotype threat and hence mars performance. Menon, Schellhorn, and Lowe (2013) reported a "cross gender style (preoccupied for boys and avoidant for

girls) (and) also reported poor well-being, indicating that self-perceived cross gender typing is distressing." (p. 1).

Learned helplessness tends to turn off, discourage and denudate the psychological foundation which provides support needed to ensure success during consequent cognitive interaction with related academic task. Final year students in Gaborone junior secondary schools who were taking their certificate examination in 2015 have habitually not been doing well in mathematics, and hence they had learned to be significantly helpless before the demands of the subject. They believed that no matter how much they studied for the mathematics examination, they will not improve their failing grades.

The more motivated a student was the higher he/she performed during the 2015 JSCE examination in mathematics in Gaborone, Botswana, but since generally these students were significantly poorly motivated, their performance in the subject during the examination was equally significantly very poor. The results reported in this study justify the significance of motivation in mathematics performance. The findings like other researches signify that there is a significant relationship between motivation and expected ad actual achievement in mathematics. Therefore, motivation has an impact in the mathematics performance of the students. The teachers have a greater role in improving motivational strategies in mathematics lessons to pave a way for high performance in mathematics. This objective could be met if there is a collaborative involvement of the student, teachers and parents. As Newman (2009) has established that over a short period of time teaching that permits risk taking, creativeness, collaboration, real life application and offers an suitable level of difficulty best motivates middle school students. The study also reveals that students who are highly motivated perform better than those whose motivation is low. Gaborone student's because they were unmotivated they performed very poorly in the 2015 JC examinations. Thus findings corroborates Ryan and Deci (2000) finding that people who are motivated because being energized perform better.

The findings imply the need for teachers to employ motivational strategies in their lessons. Student's performance is determined by how motivated they are in the subject. Therefore, the motivation should come from the students, they should have an inner drive to succeed. These findings support what other studies discovered that motivation involves active involvement of teachers and students (Saeed & Zyngier1, 2012). The government also has a role to play to ensure that motivational strategies are employed in all levels of education. This study therefore is very important as it serves as a reference point for future similar researches.

Recommendations

Mathematics is the language of science and technology which drive the development of nations and any nation is developed to the extent that she is able to grow or conscript them for all her development endeavours. Therefore no development-conscious nation, like Botswana, can afford to pay lip service to the development of mathematics-related potentials of its citizens. Every child has inborn potential in the area of mathematics, it is

the society, through her socialization process, that has stifled the realization of such potential. The government should ensure that studies are carried out to identify and recommend ways of reducing the influence of socialization on learners' disposition and performance in mathematics.

Instead of expressions and actions that tend to repel a child's mathematics-related psychic, parents should help the child to see how mathematics is applicable to their everyday living, like in shopping, travelling, banking and games they play for fun. Mathematics skills are basic to successful and gainful interaction with others and with the environment hence they are skills they need and use daily. Parents should encourage their wards to be involved with playing games that provoke numerical skills and understanding. They should watch statements and expressions, including even facial expressions, they make when it comes to discussing anything related to mathematics. They should insist on persistence and determination when faced with mathematics related challenges.

Success at teaching mathematics especially at the pre-tertiary levels require more of commitment and emotional than numerical skills. At this level, a mathematics teacher who is cognitively very good in the subject but not good at motivating learning tends to destroy learners' interest for the subject. Teachers must develop processes and strategies for provoking and maintaining a level of interest in the subject beginning even at the nursery and primary school levels. At these levels, developing positive attitude towards mathematics should be a prime objective of teaching mathematics. A period for motivating and molding learners' interest in the subject should be built-in in the mathematics time-table, and teachers should acquire some training on making very gainful use of such period.

The school administration should be creative in the arts of ensuring improvement in the performance of their learners in mathematics. Strategies for discouraging stereotyping of mathematics and learned helplessness when confronted with mathematics-related tasks should be developed and put in place as a kind of school policy.

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