

## RE-TUNING FEMALE STUDENTS' PSYCHOLOGICAL STATUS IN CHEMISTRY IN SECONDARY SCHOOLS IN KOGI STATE NIGERIA

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### ABSTRACT

*The study investigated the re-tuning female students' psychological status in chemistry in secondary schools in Kogi State, Nigeria. The purpose was to investigate the psychological status of the female students as against their male counterparts in the pursuit of chemistry and the motivational status of the female students as against the male students and to know the interest status of the female students against the males. Three hypotheses were used in the study. A sample of six hundred (600) was randomly selected from Central and Western Senatorial Districts of Kogi State (300 females and 300 males). The study design was survey. The instrument used for data collection was questionnaire, structured and validated (with face and content) validity and subjected to a test re-test reliability index of 0.75r. Data collection was carried out by the six research assistants used for the study. Data was analyzed using Spearman Ranking Order at 0.05 level of Significance and at 598 degree of Freedom. The study indicated that female students do not study chemistry based on phobia and the female students believed that chemistry is time consuming, has a lot of theories and more calculations. The study recommends among others that female students who pass chemistry with high grade should be given incentives in monetary and award of excellence to motivate others.*

**Keywords:** re-tuning, female students, psychological status, chemistry, secondary schools

### INTRODUCTION

Education is the bedrock of any progressive and durable society and it helps to prepare both genders (male and female) in national, economic, political and social development that will give room to participate equally. The concept of chemical technology is the study of technology that aids in doing chemistry; it is the use of equipment to assist in chemical processing. This represents a very wide range of applications from research to waste management. Chemical technology is the application of all principles in studying of chemistry to our daily human life. It involves knowledge and skills in chemical analysis. This living or principles must come from the human mind and the mind is made up of many things which including memory, intellect, understanding, consciousness, reasoning, will-power, imagination, belief, personality and choice making.

According to Harold, John, Anita, Charles and Franklin (2005) the human brain which is the center of all mental qualities, provide information about light, sound, intelligent quiescence and the mental health. Mental health is described as a level of psychological wellbeing or an absence of mental disorder. Mental health may include individuals' ability to enjoy life and create a balance between life activities and efforts to achieve psychological resilience. It can be defined as an expression of emotions and signifying a successful adaptation to a range of demands. World Health Organization (2001) defines mental health as "a state of well-being

in which the individual realize his or her abilities, can cope with normal stresses of life, can work productively and fruitfully and is able to make a contribution to his /her community. It involves feelings, attitudes, actions, and emotionally based feelings. Studies have shown that feelings, actions and attitudes are the fulcrum for students' academic successes or failures in schools.

These achievements in learning, studying and training are all anchored on some psychological variables, these variables ranges from genders, location/environment, teaching methods, type of school. Balogun (1985) carried out a study titled "interest in science and technology education in Nigeria and gender issues in education, teachers mediating role. The study discovered a wide gender gap in students' achievement in science and related courses in co-educational schools and linked this to uncondusive classroom environments. It further reveals that the better performance of male students is as against the female students in science subjects at O/L.

Neathery (1999) carried out a study on chemistry and secondary students' perception towards science correlation with gender. The study reveals that gender is not a predictor of science achievement and behavior towards science. While in Nigeria Nworgu (1985) found that sex differences in students in science achievements are in favour of male students. Ezeife (1990) working on sex and environment as factors in science achievement found that male significantly achieve better than females irrespective of school location. However, females in urban schools out-perform females in rural schools. Oriator (1990) wishing to determine the performance pattern among female and male students in science found that there is a significant differences in performance of boys and girls. Ssempala (2009) worked on "gender difference in the performance of chemistry practical skills among senior six students in Kampala district. The study aim was determine if there were gender differences in the performance of chemistry practical skills among senior six in Kampala's district from February to March 2004. The sample was drawn from five mixed schools with a total of fifty students. Twenty five of them were girls and the other twenty five were boys. Descriptive design was employed and the study revealed gender difference favouring the male as against the female students.

Ukwungwu (1996) working on the correlation of physics achievements among the gender found out that all the sexes has a moderating influence on the achievement of students in physics. Ugwu (1993) and Nwachukwu (1999) found that there is a significant difference in male and female achievement in physical sciences. Ezeudu (1998) studied the interaction effect of concept mapping and gender achievement in organic chemistry concept and found that achievement was influenced by gender, while Obot (1997) in a study on interaction effect on innovating in chemistry teaching and gender on students concepts attainment, revealed that gender had no significant effect on teaching methods.

Opara (2008) also study on effect of gender on student cognitive achievement in qualitative chemical analysis, the study revealed no significant effect of gender on secondary school students' zeal in cognitive achievement in qualitative chemical analysis. Similarly, studies by Twoli and Power (1989) study titled "major influence on science achievement in developing countries" revealed that boys are more favoured than girls in sciences achievements in schools. However, research studies have shown that instructional approaches promote and develop students' scientific understanding and enhance science achievements. (Stohr-Hunt, 1996)

Studies have shown that a child's location /environment could affect his/her achievement in school. In a study by Bob-manuel (1997) reveal that respondents from Rivers state performed significantly better than the rural counter parts in SSCE in Biology. Other studies shown that

school attendant could have some influences on their performance too. Okonkwo (1997) indicated that children who attended private school generally do better in science than students from the public school. Differences in school and home environments could affect students' performance in sciences. Similarly location, type of school qualification and experience of teachers were some of the features that Okonkwo (1997) discovered were confirmed in the study carried out by Igwe (1999) and Bob-Manuel (1997).

The issue of teaching methods to enhance science subjects was another variable. Experimental teaching methods have been showed by researchers such as Flower and Osborn (1988) to produce mixed results. In a similar study conducted by Ngeow and Kong (2001) it was reported that students instructed with the lecture method scored significantly higher than students instructed with a problem-based teaching method. Another argument to support problem-based teaching approaches is that it develops students' critical thinking abilities and elevates the learner to a higher cognition level. The increased use of critical thinking skills enhances the students' ability to obtain, retain and retrieve knowledge. Experimental teaching has the advantages of increase cognitive achievement and retention.

In Nigeria female students are mitigated against and it is on record that the colonial masters had encouraged the gender differentials by establishing by schools during the colonial era for boys and girls (Miller, Heathey Polland and Hill (2003), Jimoh and Amao (2002) John and Maduewesi (2005) observed in their studies that female had suffered discrimination and marginalization. This notion that a woman's place is in the kitchen and that woman are made for baby feeders, is due for a review in the contemporary society to accommodate women as people who are scientific and have critical mind that can produce technological innovations in sciences such as in the chemical technology. It is on record that the study of chemical technology is better researched by women than men.

Some of the hindrances that female student faces in their academic pursuit are observed by CoHingham and Rogston (2000) and Bammeke (2001) as withdrawal from school and enforcement into early marriages and others. Some of these factors are what makes women semi-literate, half barked graduates and drop-outs. Girl child education otherwise known as female or gender education in Nigeria is under a midwifery status and there is need for its upward movement or improvement in chosen careers. Some of the chosen career are mainly dominated by male gender, allowing just a few while a lot are being hindered by ethics, culture, marriage, child birth and home building.(Ogbaraenumi 2008)

In developed countries, children of both sex's males and females are exposed to scientific learning at from the age of 4+ and they are provided with adequate and favourable environment. Osborne (2000) supported this when he observed that Japan is very advanced in science and technology today due to their educational content entrenched curriculum that is geared towards developing both gender (male and female) in the following areas:

- I. Fostering a rich and vibrant spirits in the student early in life,
- II. Providing a firm foundation for lifelong earning;
- III. Promoting quality education that spurs up individuality in various aspects in life;
- IV. Fostering student ability to constantly pursue self-education and
- V. Promoting international understanding among the citizenry.

It is on that Japan had produced women physicist, pilots, pharmacists, doctors etc. where laboratories in Japan are well stocked with materials for effective and purposeful education in Science and Technology. The preference of male children in Nigeria was supported by studies conducted by Nnabueze and Nnamdi(2009) on "teachers' stereotypes on gender

submissions. The study exhibited the differential qualities for boy and girl-child. The study revealed that most male students possess intelligent quotient, attentive zeal, resilience and logic in pursuit of academics, investigative tendency and preparedness for exploration. Similarly the study shows that high premium is placed on science and technology within the recent decade. Chemistry is taught at the secondary school level as pure science and applied science and it is a basic requirement for medical and technological courses and discipline.

Contemporarily, female students have developed keen interest in studies in science, although several variables militate against constant female success in sciences as much as success recorded for male students. The following are factors that militate against the female students ranging from tradition from being perpetually in school due to gender roles; girls have to be trained to be good wives.

A Feminist status that is girls are not particularly preferred to be too inquisitive to science that may hinder her believe in God; as to disrespect the ethics of the society and become deficient as mothers of a nation. Dressing culture in science is not also significantly favourable for women folk such as wearing of jeans trousers, apron or over all are debasing to women. Feminine insulation (excess restriction) begets an avenue for inability to access brilliant reasoning and exercising or utilizing same over the man (husband) who is the overall boss, controller, and the commander-in-chief in the home.

### **STATEMENT OF THE PROBLEM**

There are established negative factors that work against the girl child education or gender/female education in sciences in Nigeria, especially in chemistry. Studies have shown that science concept is better conceived from age 9-18years according to child development psychology and learning processes psychology.

In Nigeria and in Africa, it has been noted in most culture that these are the ages female or girls are betrothed and some would be mothers of 2-3 children before 20year while the male counterpart will not be hindered from their education. In some cases girls step out of school for their brothers and they will be made to help in the farm work and family business. With the forces against girl child education in the developing world, the worry now is how can the female students be encouraged to have interest in the study of sciences with particular reference to chemistry in the secondary schools for innovative chemical technology in Nigeria?, having this common knowledge empirically through child psychology of learning which has shown that science concept is better conceived at ages of nine (9) years to eighteen (18) years.

Sadly, enough, it has being observed in many schools in Nigeria that female students are presumed to evade studying chemistry due to several factors like psychological, motivation and interest. Pursuance of studies in chemistry by students beyond secondary school levels is not common. Women scientists are very few in Nigeria. What could have been the reason?, could this be as a result of lack of scientific orientation significantly negate technological innovation in Nigeria. This females' non-involvement in scientific studies had created male dominance in technological advancement in Nigeria and it is against this background that this study is set to investigate.

### **RESEARCH QUESTIONS**

1. Does psychological status of female students inhibit their academic pursuit in chemistry than male students?

2. Does motivational status of female students inhibit their academic pursuit in chemistry than male students?
3. Does interest status of female students inhibit their academic pursuit in chemistry than male students?

### RESEARCH HYPOTHESIS

- I. Psychological status of female student does not significantly inhibit their academic pursuit in chemistry than male students.
- II. Motivational status of female students does not significantly inhibit their academic pursuit in chemistry than male students.
- III. Interest statuses of female students do not significantly inhibit their academic pursuit in chemistry than male students.

### SIGNIFICANT OF THE STUDY

This study is embarked upon to:

- a. Investigate whether psychological status of female students debarred them from studying chemistry, than male students and to male both students prefer studies in chemical engineering for innovative technology.
- b. Elucidate succinctly the role of motivation in female students' preparedness for studies in chemistry than can transform them into studying medicine or chemical related technology.
- c. Advance interest as the bedrock of female students' zeal for studying chemistry.

### RESEARCH METHODOLOGY

The research design for this study was a survey method. The population for the study was six hundred (300 males and 300 female) students randomly selected from thirty (30) secondary schools from central and western senatorial districts, Kogi state, Nigeria. The instrument used for data collection was Researchers' structured, validated and reliable Gender psychological status inventory (GPDI).

The inventory was validated by face and content validity. 2 Ph.D (Health Education) lecturers made input and ascertained the instrument as comprehensive in covering the area of study. The reliability of the instrument was determined by a Test-Retest method of a pilot study. The reliability value obtained was 0.75r. The data collected for the study was by the Researchers and six (6) Researcher Assistants that were motivated. Data gathered was analyzed using Spearman Ranking Order @ alpha 0.05 level of significance and 598 degrees of freedom.

### RESULTS AND DISCUSSION

The result of data analysis and discussions of the findings were presented in the research hypothesis below:

#### Research Hypothesis I

Psychological status does not significantly influence gender difference in students' performance in chemistry.

**Table 1a. S-Rho Psychological status influencing gender difference in academic performance in chemistry**

Variable Statement	Response			Inference			Hypo @0.0
	Sex	Yes	No	RX	RY	RX-RY	D2 5
Studying chemistry is brain tasking. It requires learning formulae by heart. Forgetting formulae render calculations wrong.	M	100	200	1	3	2	4
	F	215	85	2	2	0	0
Failing grades in chemistry could be suicidal. One has to repeat class severally	M	95	205	2	2	0	0
	F	200	100	3	1	2	4
Chemistry is a dangerous subject. Chemicals turn and deface someone. Inhaling dangerous chemicals cause health problem.	M	75	225	3	1	2	4
	F	225	75	1	3	2	4
Total						M	8
						F	8

Source: Field survey (2013)

S-Rho (M) calculated > S-Rho Critical \* S-Rho (F) calculated > S-Rho critical \* df = 598

**Table 1b. Showing summary of the Psychological Statue influencing gender difference in Chemistry**

S-RhO Calculated	S-RhO Critical	df	Hypotheses @ 0.05	Result
Obtained from the analysis	Obtained from the table	P <sup>2</sup>	@ 0.05 & @ 299 degrees of freedom	Psychological statuses significantly influence gender difference in chemistry. Female students are more embarrassed at studying chemistry than males
0.997	0.064	598	Rejected	
0.999	0.064	598	Rejected	

In table 1b: M-S-RhO = 0.997 and F-S = 0.0999 > 0.064. The stated null hypothesis is rejected at alpha 0.05 level of significance and 598 degree of freedom. Psychological statuses significantly influence gender difference in academic performance in chemistry than males. 66.7% (200) boys signified that studying chemistry is not brain tasking. That learning formulae by heart is fun. That as soon as one recognizes the formula, calculation is always right. While almost all the 300 females (71.7%) said studying chemistry is brain tasking: that it requires learning formulae by heart: that getting formula wrong renders calculations wrong.

Why must the females be so afraid of chemistry in Nigeria, especially in the Central and Western Senatorial District, Kogi State? Whereas Jimoh (2002) showed no gender difference in chemistry; but he however asserted that male students from urban schools perform better than the female students from rural schools. Could this observation be associated with the fact that schools from the rural areas do not have qualified teachers and the required materials (laboratory equipment) are not available as obtained in the urban schools? Mustn't schools in the rural areas be funded adequately with both human and material resources?

### Research Hypothesis II

Interest status does not significantly influence gender difference in students' academic performance in chemistry.

**Table 2a. S-Rho analysis interest status significantly influences gender difference in academic performance in chemistry**

	Variable Statement	Response Inference						D <sup>2</sup>	Hypo @0.05
		Sex	Yes	No	Rx	Ry	Rx-Ry		
1	I love the nature chemistry studied the yam and says that it contains a chemical that makes it slimy and draws. The chemical is called amylopsin	M	215	85	2.5	1.5	1	1	Rejected
		F	210	90	2	2	0	0	
2	Chemical induces one to study very necessary to study very hard in school to pass examination	M	213	87	1	3	2	4	
		F	220	80	1	3	2	5	
3	Constant practice of chemistry makes one perfect. Constant practice is best in academics. It is necessary to study for high grades	M	215	85	2.5	1.5	1	1	
		F	150	150	3	1	2	4	
Total						M	6		
						F	6		

Source: Field survey (2013)

S-Rho (M) calculated > S-Rho Critical

S-Rho (F) calculated > S-Rho critical

df = 598

**Table 2b. RhO Summary on interest and academic performance in chemistry**

S-Rho Calculated	S-Rho Critical	Df	Hypotheses @	Result
Obtained from the analysis	Obtained from the table	p-1	At 598 degree of freedom	Interest status significant influence gender difference in students' academic performance in chemistry. Male's students engage in constant practice than females.
M = 0.9986	0.064	598	Rejected	
F = 0.9997	0.064	598	Rejected	

Table 2b above M-S-Rho 0.998 and F-S-Rho 0.999 > S-Rho critical (0.064); the stated null hypothesis is rejected at alpha 0.05 level of significance and 598 degree of freedom. Interest status significantly influence gender difference in students' academic performance in chemistry. Male students engage in constant practice than females. Therefore male students score more marks than female students. This discovery supports Idowu (2006) who pointed out that female student studying chemistry are very few. And that's why male engineers are greater in number than female engineers.

### Research Hypothesis III

Motivational status does not significantly influence gender difference in students' performance in chemistry.

**Table 3a. Motivational status influencing gender difference in academic chemistry**

	Variable Statement	Response Inference						D <sup>2</sup>	Hypo @0.05
		Sex	Yes	No	Rx	Ry	Rx-Ry		
1	Chemistry can enable me to study medical sciences. I admire doctors	M	215	75	3	1	2	4	Rejected
		F	235	65	2	2	0	0	
2	Chemistry can allow me to make my own cosmetics. I will make mild ones that cannot bleach the skin	M	246	55	2	2	0	0	
		F	215	85	3	1	2	4	
3	Chemistry can make me find job easily. Chemistry teachers are scarce in Nigerian secondary schools.	M	250	50	1	3	2	4	
		F	245	55	1	3	2	4	
Total						M	8		
						F	8		

Source: field survey (2013)

**Legend**

S-Rhp (M) calculated > S-Rho critical

S-Rho (F) calculated > S-Rho critical

df = 598

**Table 3b. S-Rho summary on motivational status and academic performance in chemistry**

S-Rho Calculated	S-Rho Critical	df	Hypotheses @	Result
Obtained from the analysis	Obtained from the table	P <sup>-1</sup>	At 598 degree of freedom	Motivational strata significantly influence gender difference in students; academic performance in chemistry. Male students are greatly motivated due to job provision
M = 0.997	0.064	598	Rejected	
F = 0.998	0.064	598	Rejected	

Table 3b above shows S-Rho summary on motivational status and academic performance. M-S-Rho = 0.997; while the F-S-Rho = 0.998 and the S-Rho critical = 0.064. the M-S-Rho & F-S-Rho calculated > S-Rho critical (0.997 & 0.998 > 0.064) the stated null hypothesis is rejected at alpha 0.05 level of significance and 598 degrees of freedom. Both males and female students are aware that chemistry can fetch them, job. So, the female gender is aware of the values of chemistry; but as Jimoh and Amoo (2002) and Maduwesi (2005) had noted, females don't study beyond secondary education in Nigeria. Though as innovative technology is on female chemical engineers had to be trained to compete with Japanese scientist (Osborne 2000).

**CONCLUSIONS AND RECOMMENDATIONS**

Based on the results of data analysis and the discussion it could be concluded and recommended as follows:



1. For innovative chemical technology to survive within the female gender in Nigeria, female students have to be assured that chemicals cannot destroy their health; and that chemical titrations have safely procedures.
2. The chemical formulas had to be simplified and made easy for both sexes (males & females) students to develop zeal to studying it. Most female are afraid of calculations involved in chemistry. There should be more practical than theories.
3. The female students do not practice chemistry; they are afraid it is time consuming. Most girls do not offer chemistry. Whereas easy grasp of theories, concepts and calculus enables students to pass science easily especially chemistry.
4. Students should be allowed to have an orientation on the chemistry equipments, supplies and safety precautions even before chemistry lessons commenced.
5. Students should touch, feel and smell different chemicals that are not dangerous to the nostrils and students health. Explanations should be thoroughly made on state of chemicals, types of chemicals to forestall fright, withdrawal syndrome, and hatred of chemistry.
6. Female students who score high grades in chemistry should be given awards and monetary rewards for excellence to motivate other female students. Male students who score 75% in chemistry should also be awarded.
7. Both awards to monetary rewards should begin from senior secondary school (SSSI) in all schools in Nigeria.

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