



The Relationship among Teachers' Problem Solving Abilities, Student's Learning Styles and Students' Achievement in Biology

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ABSTRACT

This research work was carried out to find out the extent of relationship among teachers' problem solving abilities, students, learning styles, and students' achievement in Biology. The research survey design was adopted in the study. A total of one hundred and fifty (150) randomly selected senior secondary school II (SS II) Biology students and ten (10) biology teachers from the five (5) selected schools in Lagos Mainland local government area of Lagos State served as the subjects of the study.

Data were analysed using simple regression analysis, statistical package for social sciences (SPSS) such as mean, percentage, t-test and analysis of variance (ANOVA).

Outcomes of the findings from the study include:

- *The relationship between teachers' problem solving abilities and students academic achievement in biology is positive and significant.*
- *The relationship between students' learning styles and their academic achievement in biology is positive and significant.*
- *The effect of teachers' problem solving abilities, students, learning styles on students' academic performance in biology are positive and significant.*
- *Based on these, it was concluded that teachers' problem solving abilities and students' learning styles have significant effects on the student's achievement in biology.*

INTRODUCTION

The average students' performance in biology in the senior secondary school certificate examination (SSCE) and the national examination council (NECO) is nothing write home about, the fact that some students see physics as the subject that discourages them from studying science at the senior secondary school level is no longer news.

According to the National Policy on Education (1998), the goal of primary of education is the laying of a sound basis for scientific and reflective thinking and while the goal of secondary education is aimed at providing well trained manpower in applied science, technology and commerce at the sub professional grades. Hence the major objective of teaching biology in school is not only to communicate the spirit of science but also to ensure that students acquire skills of science (Ogunleye, 1999).

Furthermore, the policy states that the goals of science education are to:

- Acquisition of knowledge, skills, inquiry and rational mind for conduct of a good life and democracy.
- Produce scientists for the nations development
- Service studies in technology and the cause of technological development.
- Understanding of the complexity of the physical world, the forms and the conduct of life.

These goals cannot be achieved when student exhibit poor performance in sciences, biology especially? But these goals can be achieved by focusing on teachers' problem solving – solving abilities to bring about desired improvement in students learning outcome and biology especially in senior secondary school.

Thus a good biology teacher is expected to possess good teaching quality, expertise, proper management ability and good interactive skills. The students' learning styles on their academic achievement in biology is not supposed to be neglected. The students' learning styles refers to the independent forms or ways students receive and process information, it implies that the student skills and preference in receiving and

processing information differ. The learning styles exhibited by students depend on two major factors namely:

- The way students perceive information
- The way they process information.

These learning styles can be determined from the different learning modalities which include:

- **Visual Modality:** students' learn by seeing or using their sense of sight.
- **Auditory Modality:** Students learn through instruction or teacher talk of which the sense of hearing is greatly involved.
- **Kinaesthetic Modality:** Students learn by doing and being physically involved.
- **Tactile Modality:** The student makes use of their sense of touch to learn.

From the learning modalities as briefly discussed it is possible to classify different learners into four (4) groups according to learning styles which are:

- **Imaginative Learner:** The learner receives information concretely and processes it reflectively. He learn well by listening and sharing with other and integrating the ideas of other with his own experience such a learner prefer student – student classroom interaction.
- **Analytical Learner:** This kind of learners perceives information abstractly and processes it reflectively. He also likes to read and values expert opinion.
- **Common sense Learner:** He perceives information abstractly but processes it actively. He likes practices work and enjoys being actively involved in what is being taught especially if relevant to his life.
- **Dynamic Learners:** He perceives information concretely but processes it actively. He is excited in learning new things. He takes risk and become bore if learning is tedious and too sequential.

This study was set out to determine the factors that enhance teachers' problem solving abilities and students' learning styles in order to facilitate students' achievement in biology.

STATEMENT OF THE PROBLEM

The success of any educational problem depends on the calibre of teachers. Ajeyalemi (1990), opined that the students' poor performance and lack of interest in science, biology is as a result of lack of qualified teachers and facilities in biology education. If teachers from any other field mandated to teach biology in those schools, in such cases due to the abstract nature of biology the learners will not be able to benefit maximally from the lesson because the teacher is not a professionally trained in the mandated field of study and also the students' learning styles are not taken into consideration. Thus, this justify the relevance and timeless of the study.

LITERATURE REVIEW

Literature review is undertaken to provide vital information on what researchers, educators, and recognized authorities have done on the problem under study.

Educationist have laid a lot emphasis that a good biology teacher is expected to possess at least in university degree and it should be realized that the work goes beyond the scope of secondary school work. However a teacher who possesses a National College of Education (NCE) certificate should not be looked down upon.

Ogunleye (1999) cited Ukeje in his book to have said that the poor achievement in science (Biology in particular) is due to teachers who are not qualified and not interested in their fields of study as some teach at the limits of their knowledge and lack of knowledge in planning and selecting teaching methods and resource management.

The quality of a teachers' teaching determines to a large extent the students' level of understanding. Studies have shown that teacher quality is the most important educational input predicting students' achievement. According to the findings of Aguirre, Haggerty and Linder (1990), Kerby and Cook (1993), and Tabin la Master (1995) reveal a wide range of ideas and belief about teaching and learning. Some teachers believe that students' learning must come from students themselves as a form of inquiry. Adaptive expertise as it has been elaborated in the literatures on expertise, problem-solving and learning

is a broad construct that encompasses a range of cognitive, motivational, and identity or personally related components as well as habits of mind and dispositions.

Crawford *et al* (2005) reviewed the construct of adaptive expertise has conferred which includes innovativeness, flexibility in problem solving and learning through problem-solving. They conclude by presenting their analytical framework for investigating adaptive expertise in teachers' reasoning. Their research focused on cognitive and meta-cognitive processes and professional dispositions that can enable teachers to extend their knowledge and procedures. Their work builds on Shulman's (1996, 1997) theory and research on the knowledge base for teaching, on Ball and Chens (1999) work on teachers' learning through everyday practices.

Learning styles is defined as the independent ways students receive and process information. It is also defined as the manner in which students of all ages are affected by their sociological needs, immediate environment, physical characteristics, emotionality, and psychological inclinations (Carbo, Dunn and Dunn, 1996). Learning styles as defined by Pat Guild (1994) are conceptual behavioural, cognitive and affective patterns that are displayed overtime and tasks. Gregoric (1999) asserts that one's learning style is made up distinct behaviours that serve as indicators of how one learns and adapt to the environment.

Gardner's theory of Multiple Intelligence (MI) has a rather different underlying structure than many of the current learning styles theories. According to Armstrong (1994), the Multiple Intelligent (MI) theory is a cognitive model that seeks to describe how individuals use their intelligence to solve problems. Krinsky (1991) found that students who favoured bright light performed better when tested in brightly lit areas. The students who preferred dim light equally as well as in a dim setting. When placed in a mismatched light environment, the students performed statistically less well.

Generally, the performance of students in biology is always poor. This is attributed to many factors as discussed by many educational researchers. Such factors include:

- Teachers inadequate teaching styles.
- Lack of easy to read biology textbooks in the market.
- Lack of laboratory facilities in some schools.
- Dearth of qualified biology teachers in schools.

Onwioduokit (1996) identified the following factors as responsible for students' poor performance; poor students' attitude, insufficient manpower, lack of equipment and poor understanding of the concept involved due to their abstract nature.

PURPOSE OF THE STUDY

The purpose of this study is to determine the relationship among the teachers' problem solving abilities, students' learning styles and students' academic achievement in biology.

RESEARCH HYPOTHESES

Ho₁: There will be no significant relationship between teachers' problem solving abilities and the academic achievement of biology students.

Ho₂: There is no significant relationship between students' learning styles and their academic achievement in biology.

Ho₃: The main and interaction effects of teachers' problem solving abilities and students' learning styles in the achievement of biology students.

RESEARCH DESIGN

The study adopt a simple survey design, it was limited to senior secondary school II (SS II) biology students and their teachers in Lagos Mainland Local Government Area of Lagos State. A total of one hundred and fifty (150) students (male and female) and ten biology teachers students (male and female) were selected from five (5) different schools using the simple random sampling technique.

INSTRUMENT

For the purpose of data collection, the instruments used in the course of this study are questionnaires and biology students achievement tests (PSAT). The questionnaires were of two types.

1. Questionnaire on Teachers' Problem Solving Abilities (QTPSA) and

2. Questionnaire on Students' Learning Styles (QSLs).

The questionnaires on teachers' problem-solving abilities (QTPSA) were developed on a five (5) point Likert. The five responses used in the Likert scale include: Strongly Agree (SA), Agree (A), Undecided (U) Disagree (D) Strongly Disagree (SD).

Finally the second instrument which is the biology students achievement test (PAT) was designed to collect information about the performance of students in biology. It consists of four essay questions from which the students are expected to answer three. Each question carried ten (10) marks thus the overall mark for the test is thirty (30).

DATA ANALYSIS AND RESULT

The data analysis and results are presented in this chapter with special reference to the research question and in the study. Based on the dictate of the purpose of the study, we began the analysis by establishing if there is any significant relationship between the teachers' problem solving abilities and the students' academic performance in biology or not.

Ho₁: There will be no significant relationship between teachers' problem solving abilities and the academic achievement of biology students.

Table 1: Shows a simple regression analysis of teachers' problem solving abilities on students' achievement in biology

Variable Entered		SS	DF	R	R-Square	MS	F	Sig. (0.05)
Teachers Problem Solving Abilities	Regression	75.516	1	0.750	0.560	75.516	12.968	0.000
	Residual	3765.567	148			25.444		
	Total	3841.173	149					

The table above reveals clearly that there exist a significant relationship between teachers' problem solving abilities and student achievement in biology. It implies that the superior problem solving abilities of teachers plays a major role in students' academic achievement in biology. The relation is positive, very high and significant 5% level of significance. Hence the null hypothesis is dully rejected.

Ho₂: There is no significant relationship between students learning styles and their academic achievement in biology.

Table 2: Shows a simple regression analysis of students' learning style on students academic achievement in biology

Variable Entered		SS	DF	R	R-Square	MS	F	Sig. (0.05)
Students Learning Styles	Regression	15.483	1	0.625	0.391	15.48	37.212	0.000
	Residual	3835.690	148		25.917			
	Total	3851.73	149					

Table 2 shows that there exists significant relationship between students' learners styles and their achievement in biology. It implies that the students adopted learning styles is a major predictor of their achievement in biology. The relationship is high, positive and significant at 0.05 level of significance, the null hypothesis is dully rejected.

Ho₃: The main and interaction effects of teachers' problem solving abilities and students' learning styles on the achievement of biology students will not be significant.

Analysis of variance (ANOVA) was used in testing this hypothesis.

Table 3: The University analysis of variance (ANOVA) showing tests of between subject effects (i.e. teachers' problem solving abilities and students' learning styles).

Source	Type III sum of squares	DF	Mean square	F	Sig. (0.05)
Corrected model	427.778 ^a	11	38.889	1.572	0.113
Intercept	17468.120	1	17468.120	706.218	0.000
TPA	88.684	2	44.342	1.793	0.170
SLS	222.577	3	74.192	3.000	0.033
TPA* SLS	0.000	0			
Error	343.395	138	24.735		
Total corrected	40096.000	150			
Total	3841.173	149			

a. R - square = .111 (adjusted R. square = 0.041).

DISCUSSION AND CONCLUSION

Based on the results of this study, the following recommendations were made by the researchers:

Observation tests, interviews and questionnaires should be administered to student to assist teachers determine their learning styles. This would empower the teachers to assist their student improve their academic performance.

School administrator should constantly organize seminars, workshop, conference and symposium to improve students' interest in biology. Teacher should also be made to undergo retraining so that their level of teaching expertise is increased and they are able to perform their duties with great ease.

The government should make adequate provision for individuals who intend to take up science courses, biology especially, in the tertiary institutions. This will increase the availability of qualified science teachers in institution of learning.

The science curriculum should be revisited and should be made to include activities and exercise that would cater for the learning differences of the students.

Teaching aids, laboratory facilities and conditions should be made available to the teachers and students. This will motivate them and enhance their academic performance.

From the result of the study, the following conclusions were made. There is a significant relationship between the teachers' problem solving abilities and the students' academic achievement in biology. In other words, a teaching with high level of expertise and interactive skills would be able to present the subject matter in a comprehensive format to the learner. This will no doubt enhance the learners' performance.

Also, there is a significant relationship between students' learning styles and their academic achievement in biology. Adequate knowledge of the learning styles possessed by each learner will help them to adopt appropriate modes of study or study techniques that suit them.

Finally, the research result also shows that an interaction exists between teachers' problem solving abilities, students' learning styles and students' academic achievement in biology. This implies that a teacher with good problem solving ability will be able to modify his teaching style to suit his students' learning style thus enhancing their academic achievement in biology.

REFERENCES

1. Abimbade, A. (1997). Systematic Approach to Teaching learning Process". Contemporary issues in Nigeria Education. Ibadan: Y., Books Ltd., pp. 84-95.
2. Aguirre, P. T. and A.A. Haggerty (1990). *The nature of Expertise*. Hill Scale N. J.: Eribaum.
3. Ajayi, D. (1995). The school administrators' perception of student's poor performance in public examination.
4. Armstrong, A. O. (1994). "Physics workshop for secondary schools". University of Nigeria, Nsukka, (UNN). Unpublished Paper.

5. Bajah, T. (1997). "Interest in science and technology education in Nigeria". A paper presented at the 12th International Symposium on Interest in Science and Technology Education.
6. Ball, D. L. and D. K. Cohen (1999). Developing practice, developing practitioners, towards a practice based theory of professional education. In Darling L. Hammond and Styles G. (Eds), Teaching as the Learning Profession. Handbook of Policy and Practice San Francisco, C. A. Jossey bass.
7. Cole Man P. (1996). An analysis of the understanding of the nature of science by prospective Science Teachers' Science Education. 52(14); 358-365.
8. Crawford, M. V., Schizger, M. Toyama, Y. Riel, M. and P. Vahey (2005). Characterizing Adaptive Expertise in Science Teaching.
9. Carbo, M. and R. Dunn (1996). Teaching Students to read their individual Differences.
10. Cafferty, A. V. (2001). The self concept of High Medium and Low Academic Achievement", *The Australian Journal of Education*. 15(3): 319-324.
11. Fadiya, (1992). "Why use the environment to teach science" Methodology and Science Teaching (Eshiet Edu) Abak: Bel Pot (Nig.) Co.
12. Ogunleye, A. (2001). Address of the chairman Science teachers Association of Nigeria, Lagos at the 5th Annual Conference of Lagos State STAN, held in 23rd – 26th July in Lagos State.
13. Onwioduokit, F. A. (1996), "Difficult concept in Physics as Experienced by Senior Secondary Student in Akwa-Ibom State". *Journal of Research Information in Education*. 1(2): 19-28.
14. Nworgu (1998). Education and the Training of the Scientist. "Defect in our System of Training" Bulletin of the Science Association of Nigeria, Volume 1 Number 1.
15. Ogunleye, A. (1999). Science Education in Nigeria. Sunshine International Publication (Nig.) Ltd. Mushin.
16. Onyejiaku (1998). An Appraisal of Secondary School Physics Laboratory in Onitsha Local Government Area of Anambra State. Unpublished B.Sc. Ed. Thesis UNN.
17. Pizzo, J. R. and North Field J. R. (Eds.) (1995). Learning from the peel Experience Melbourne: Faculty of Education, Monash University.
18. Shulman, C. (1996). Teaching Scientist to think critically – San Francisco Jossey – Bass, Inc.
19. Wright, B. J. and Hurn, T. B. (1997). "Why Teach Physics?" Teaching of Physics. London UNESCO Source Book. Williams Clowers and Sons.