RELATIONSHIP BETWEEN STUDENT'S ATTITUDE TO CHEMISTRY PRACTICALS AND MANIPULATIVE SKILL DEVELOPMENT AT COLLEGE OF EDUCATION OJU, BENUE STATE

Peter Ogbu Agogo PhD
Senior Lecturer,
Dept. of Curriculum & Teaching, Faculty of Education
Benue State University, Makurdi, Nigeria.

ABSTRACT
This study is directed towards finding relationship that exists between students' attitude to Chemistry Practicals and their manipulative skill development at College of Education, Oju, Benue State. Two research questions and one hypothesis were proposed for testing, using Chemistry laboratory inventory and students attitude towards Chemistry practicals scale as the main instruments. From the analysis that used Pearson Product Moment Correlation Coefficient and percentages, it was found that there is a significant relationship between student attitude to practical work in Chemistry and their manipulative skill development of the NCE II and NCE III students of the College. It is recommended that Chemistry laboratories should be stocked with relevant chemicals for meaningful practical works, among others.

BACKGROUND TO THE STUDY

All science based courses require practical knowledge for better understanding. All science teachers, especially chemistry teachers are therefore expected to understand the contents of science practicals to avoid laying more emphasis on the theoretical aspects of such a science subject. This will enable all round skill development (Bomide: 1985, and Agogo, 2009). Without intensive practical chemistry work, the theory will only be like a number of ideas in a textbook that lacks proper scientific anchorage (Jeffrey, 1966).

Practical exposition in chemistry stimulates interest in the subject, which according to Ndu (1980), gives the students sense of achievement when they handle and discover things themselves in the practical class. These scientific skills (that emphasize cognitive, psychomotor and affective domains) are least stressed in most science subjecst today. This ought not to be so development of the manipulative skills enable the students to measure, handle and demonstrate, using the chemistry equipment, during practicals. Manipulative skills therefore are embedded in psychomotor domain. Good knowledge of manipulative skills and the formation of right attitudes to chemistry practical works help to minimize laboratory accidents. Ogunleye (1985) and Omotayo (2002) remarked that, encouraging accurate observation and careful recording of all practical activities help to sustain interest in science. Accordingly, Cyrill and Moses (2007) emphasized that the right attitudes are fundamental to students' good performance in secondary schools science, which enables the students to excel.

Attitude to science is seen as the readiness of individuals to respond to or react towards learning situations. Children's poor attitudes to science negatively affect their performance in science (Agogo, 2009), thus there is the need to encourage them to develop positive attitudes to science, especially chemistry practicals. The major components of scientific attitudes include curiosity, suspended judgment, objectivity, open mindedness, honesty, humility and rationality. Proper development of these attitudes positively affects chemistry practical works. According to Akpan (1986), the attitudes of students towards chemistry in urban schools are more positive than those in rural schools. He attributed this difference to the presence of Chemistry equipment and other science infrastructures in urban schools. Chemistry students at all levels of education may develop negative attitudes towards chemistry if they find it less satisfying. It is therefore important that chemistry activities should encourage practicals, where students are exposed to direct application of Chemistry knowledge.

When Chemistry students are allowed to manipulate science equipment in their practical class, they tend to enjoy its study and learning. This is why Akpan (1986) posited that the use of the laboratory

method in chemistry teaching has been found to be positively related to students' attitude towards Chemistry and therefore should be sustained.

STATEMENT OF THE PROBLEM

There has been remarkable decline in students' performance in Secondary School Chemistry Practicals which may be attributed to poor attitude formation towards it. Some of the reasons have been attributed to poor manipulative skill development (Agogo, 1988). One aspect of practical chemistry that needs more attention is the attitude formation and manipulative skill development. The problem of this study posed as a question is what is the relationship between students' attitude to chemistry practicals and manipulative skill development at colleges of Education?

PURPOSE OF THE STUDY

This study is set out to establish if there is any relationship between students' attitude to chemistry practicals and manipulative skill development in Colleges of Education.

Specifically, it is designed to:

i. Find out laboratory equipment and materials that are available in the chemistry laboratory at the Colleges of Education.
ii. Find out if any relationship exist between students' attitude to chemistry practical and their manipulative skill development

THE SIGNIFICANCE OF THE STUDY

When Chemistry students are not allowed access to chemistry instruments during practicals, they may fail to master their manipulative skills. This study will therefore encourage the development of positive scientific attitudes as they are exposed to chemistry practicals in the laboratory.

Thee significance of the study is also hinged on the fact that availability of chemistry practical materials give the students the opportunity for individual manipulative skill development. This study will encourage chemistry teachers to ensure that students acquire clear mental concepts of the motor action involved in the practical activity.

Chemistry students, especially at the College of Education level, should be able to:

- ❖ Demonstrate the use of safety procedures in the Chemistry laboratory
- ❖ Use the chemical balances in weighing
- ❖ Clean and store glass wares and other apparatus they use in the laboratory
- ❖ Handle most chemical equipment with confidence.
- ❖ Demonstrate motor skills that are all enshrined in manipulative skills, with ease in the chemistry laboratory, among others.

This means that, chemistry students with positive attitudes to laboratory work are more competent in the manipulation of the chemical apparatus and materials than those with negative attitudes. The psychomotor skills that chemistry students learn in the laboratory vary in the amount of motor skills and their perceptional involvement. Proficiency in manipulative skills has generally been inferred from the quality of the experimental results communicated by students to the examiner in their reports. Chemistry practical activities are therefore indispensable to the realization of the objectives of chemistry teaching at all levels.

RESEARCH QUESTIONS

1. What laboratory equipment and materials are available in the Chemistry laboratory at the College of Education, Oju?
2. Is there any relationship between students' attitudes to practical work in chemistry and their manipulative skill development at the College of Education, Oju among NCE II and NCE III students?

RESEARCH HYPOTHESIS

There is no significance relationship between students' attitude to practical work in chemistry and their manipulative skill development at the College of Education, Oju among NCE II and III.

METHODOLOGY

The study employed survey design. The area of study was the College of Education, Oju, Benue State. Oju Local government area is in the Benue South Educational District, with a population of about 350, 500 people. In addition to the College of Education Oju, LGA has twelve grant-aided Secondary Schools and many primary schools in the area. It is a rural based community with very few government presence.

All the NCE II and NCE III Chemistry students formed both the population and sample of the study, a total of 25 students. 23 out of the 25 students returned their ACPs questionnaire, representing 92% return rate.

The instruments were the Attitude towards Chemistry Practical Scale (ACPS) and chemistry Laboratory Inventory Check list. The inventory checklist was used to analyze research question one, while simple percentages was used for research question two. Strongly agree and agree in Likert Scale are combined to give positive response, strongly disagree and disagree are combined to give negative response while neutral is left negative. This is used for the analysis.

The hypothesis was analyzed using Pearson Product Moment Correlation Coefficient, using the NCE II and NCE III Chemistry students of the college. The scores for ACPS were used for the analysis.

RESULT OF THE FINDINGS

The research questions and the hypothesis were analyzed as follows:

RESPONSE TO RESEARCH QUESTION ONE

"What laboratory equipment and materials are available in the chemistry laboratory at the College of Education, Oju?

College of Education Oju, has a functional chemistry laboratory where all chemistry practicals take places. The college has the following items in their chemistry laboratory.

Table I: Items in the Chemistry Laboratory

S/NO	Items (Equipment/Materials	QTY	Remarks
1.	Has out lets	15	All functional
2.	Water sources (Taps)	10	All functional
3.	Fire Extinguishers (CO_2 types)	3	2 functional ones
4.	Weighing balance (Top Loading)	4	3 functional ones
5.	Electrical/Mechanical centrifuges	3	2 functional ones
6.	Fume Chambers/cupboards	2	2 functional ones
7.	Safety Kits/ sand buckets etc	4	4 all functional
8.	Drying oven	1	1 functional ones
9.	Mortars and pestles	12	10 functional ones
10.	Beam balances	3	2 functional ones
11.	Distilling apparatus	3	2 functional ones
12.	Desicators (various sizes)	6	5 functional ones
13.	Stop watches	5	4 functional ones
14.	Kipps apparatus	2	2 functional ones

15.	Tripod stands	2	2 functional ones
16.	Retort stands	18	18 functional ones
17.	Ring Hooks	21	21 functional ones
18.	Burnsen burners	23	23 functional ones
19.	Burettes (50cm^3)	11	10 functional ones
20.	Pipettes (Various sizes)	22	2 functional ones
21.	Liebig Condenser	3	17 functional ones
22.	Test tube racks	17	17 functional ones
23.	Test tubes (Various Sizes)	43	40 functional ones
24.	Chemicals (various types)	46	46 functional ones
25.	Refrigerators	2	1 functional ones

Table I is the table of inventory of chemical equipment and materials that chemistry teachers and students use during their practical classes. These items are able to give the students acid base titrations (quantitative) and also qualitative analysis practicals. There were no ices making machines except for refrigerators, so not much of organic chemical practicals that require cooling could be done easily. Each student was assigned to a locker with large enough space for meaningful practical work; which allowed for manipulative skill development. NCE II and NCE III students usually have their separate days for the three hour practicals each week. They are usually allowed full access to chemistry laboratory during all practical sessions, in the presence of the course lecturer or the laboratory attendants.

RESPONSE TO RESEARCH QUESTION TWO

Is there any relationship between students' attitude to practical work in chemistry and their manipulative skill development at the College of Education, Oju among NCE II and NCE III student?

Table 2: Responses relevant to research question Two

Questions	Positive Response	Neutral	Negative Response
Questions 1-10	72	12	36
Percentage (%)	60	10	30

From Table 2, 60% of the respondents agreed that there is a positive relationship between students' attitude to practical work in chemistry and the students' manipulative skill development at the college. 10% of them were undecided and therefore were neutral, while 30% of them said there is no relationship at all.

ANALYSIS OF THE HYPOTHESIS

There is no significant relationship between students' attitude to practical work in chemistry and their manipulative skill development at the College of Education, Oju.

The Attitude towards Chemistry Practical Scale (ACPS) scores are used for this analysis, using Pearson Product Moment Correlation Coefficient.

Table 3: Summary of Calculated 'r' Value.

N	df	^{r}cal	^{r}tab	Decision
23	22	0.495	0.404	reject

Table 3 shows that r-calculated (0.495) is greater than r-tabulated (0.404) at 0.05 level of significance. This means that the hypothesis is rejected, meaning that there is a significant relationship between student's attitude to practical work in chemistry and their manipulative skill development among the NCE II and NCE III students at the College of Education, Oju, Benue State, Nigeria.

DISCUSSION OF FINDINGS

When science materials that are highly needed are not available, students are forced to learn at the verbal level with little improvement on their manipulative skills. However, when the students are allowed to interact meaningfully with real science materials, they develop fully all necessary skills that are needed for

sciencing (Agogo, 1988). Chemistry students are likely to develop negative attitude towards chemistry if there are no chemicals and other equipment for practical works. The effect is that these students will not be confident in handling chemical equipment after graduation. This is why Gauld (1982) sees a real scientist as someone who displays objectivity, emotionality, open mindedness as well as development of relevant skills during sciencing. Practical activities are therefore necessary in all sciences. To Mustapha (2002), practical works in sciences provides learners with opportunities to use scientific equipment to develop manipulative skills, which engenders to greater achievement in the subject.

Failures in chemistry are attributed to poor performance in practical work in chemistry. This is because students usually develop negative attitude to chemistry when they do not have enough equipment or chemicals for real practical work (Ochulu, 1985 & Agogo, 1988). This study has established that scientific attitudes are related to manipulative skill developments which are made manifest during practical chemistry works. According to Agogo (2009), science carries a masculine image, which encourages manipulative skill development. This means that, practicals chemistry activities should be emphasized at the College of Education, because the students are expected to graduate as teachers of chemistry, who should be comfortable with chemical equipment and materials. This is why Mustapha (2002) posits that practical works in sciences aids the students to develop a problem-solving attitude that is needed for work in science, especially in chemistry.

CONCLUSION

The presence of science equipment and other chemicals for chemistry practicals help to develop the students' manipulative skill, and are necessary for better understanding of the subject. Laboratory activities in chemistry shall continue to serve as a great encouragement to positive attitude development in the subject. It is also important to know that chemistry teachers with positive attitudes towards chemistry practical easily learn how to handle these equipment with confidence. This would ignite positive attitude development in the students' chemistry laboratory activities, which they are expected to retain after the College training. The more the students are exposed to equipment/materials in the chemistry laboratory the better the students interactions with these materials and the greater the chances of performing well in the subject.

Scientific attitudes therefore help to build the teacher's self concept and they represent the motivation that converts knowledge and skill into action which all chemistry teachers should encourage. This is because students learn chemistry best by being actively involved in the learning act as well as the learning materials.

RECOMMENDATIONS

The study hereby recommends that:

i. Colleges of Education should ensure that their science courses, especially chemistry, should be stocked with appropriate chemicals and equipment to ensure meaningful practical works
ii. Science students, especially in chemistry, should be taught to develop positive attitude towards chemistry practical works.
iii. Chemistry teachers should be encouraged, through good conditions of service, to teach so as to instill scientific attitudes in their students.

REFERENCES

Agogo, P. 0 (2009). *Topics in Primary Science Education in Nigeria.* Makurdi: Azaben Press.

Agogo, P. 0 (1988). Students Attitudes and Manipulative Skill Development through Chemistry Laboratory Work in Two Colleges of Education. Unpublished M.Ed (Sc.Edu), Thesis University' of Jos, Jos.

Akpan, B.B (1986). The relationship between students learning environment and their attitudes towards chemistry in selected secondary schools In cross River state. Unpublished M.Ed thesis, university of Jos, Jos.

Bomide C.S. (1985). Science teaching in the period of recession: the need for improvision, Journal of science teachers)

Cryil, M. U and Moses, D (2007) the attitude of students towards computer education in Federal Unity Colleges. *Journal of research in curriculum and teaching.* 2 (1), 95 - 102.

Cauld, C. (1982). The scientific attitude and science education: a critical reappraisal. *Science Education.* 66 (1), 109-121

Jeffery, R.W et' al(1966). *Qualitative and Titrtmetric Analysis for Tropical Wools.* Ibadan: Macmillan Publishers Company (Nig) Ltd. P.Z.O

Mustapha, M. T. (2002). Integrated Science Lecturers perception of practical work assessment practices in college of education in Nigeria. *The Nigerian Teacher Today.* 10(1), 1-12.

Ndu F.O.C (1980). Planning and organization of practical work in Biology in secondary schools. *Journal of Science Teachers Association of Nigeria* (J. *of STAN).* 18(2),49-60.

Ochulu, A.O (1985). Guidelines to the teaching of qualitative analysis practical chemistry in secondary schools in Otukpo metropolises. Unpublished NCE project, college of education, Katsiona-Ala.

Ogunleye, A.O (1985). A review of laboratory practical objectives, their education strategies and implication for science education in Nigeria. 26th STAN annual conference proceedings. Owerri, 97-101.

Omotayo, K.A. (2002). Correlates of attitudes towards science and academic achievement of secondary' schools students in science subjects. *The Nigerian TEACHER TOADY* 10 (1), 119-125.