Volumetric analysis and chemistry students performance: Combined influence of study habit, physiological and psychological factors

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Several factors can work in concert to influence the students’ attitudes and behavior towards quantitative aspect of practical chemistry particularly volumetric analysis. This study investigated the influence of students’ study habit, physiological and psychological factors on their attitudes and behavior towards the volumetric analysis in practical chemistry. Two hundred and forty randomly selected senior secondary two students from six secondary schools in Akure South Local Government Area of Ondo State constituted the sample. It was hypothesized that students’ study habit variables such as time allocation, reading and note-taking, concentration, anxiety and stress, and teachers’ consultation would not significantly influence students’ attitudes during volumetric analysis practical exercises. The hypotheses were tested by using chi square at 0.05 levels of significance following the administration of study habit inventory on the subjects. The results indicated that these factors actually influenced the attitudes of the subjects towards volumetric analysis exercises. It was recommended that chemistry teachers need to have proper understanding of these physiological and psychological factors to enable them enhance students’ attitudes and performances in practical chemistry.

Key words: Volumetric analysis, study habit, physiological and psychological factors, students’ attitudes and performance.

INTRODUCTION

Most chemistry educators regard practical chemistry as very important for various reasons which include motivation, concept learning and the development of skills and appropriate scientific attitudes. This is in line with the objectives of chemistry education (Bradley, 1999; National Education council, 2002). These objectives may not have been achieved due to poor study habits and other factors which include physiological and psychological parameters in the living and learning environments of the students. Chemistry is essentially a practical oriented subject which demands proper exhibition of good study behaviour for effective interpretation of existing phenomena (Njelita, 2008). Students are rarely exposed to practical work. Lee and Fraser (2001) reported that science teachers usually do not place much value on laboratory activities since they feel this takes time away from teaching to cover the prescribed examination-driven curriculum. Akpan (1999) observed that lack of practical activities by chemistry students has resulted in poor communication and observational skills. The absence of these skills gave rise to students’ poor performance in chemistry especially in volumetric analysis. Individual’s studying pattern/behaviour affects the amount of information which such individual add into his long term memory. Study habits refer to whether students study at the same time each day, whether they shut off radio, television while reading and whether they paraphrase and write down what they have read during the practical instructions, whether they use supplementary

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materials in their personal studies. Study habit also describes some external activities which serve to activate and facilitate the internal process of learning as defined by Rothkopf (1982). Physiological and psychological factors include anxiety, stress from outside engagement like chores, parental involvement in homework, hunger, lack of care and affection which could have transferred effects on students’ learning in school.

Many studies have been carried out which make it available today of an important catalogue on study habit (Ogunmakin, 2001; Kumar, 2002; Gbore, 2006). They argued that study habit have strong relationship with academic performance of students while other researchers (Owolabi, 1996; Whihte and D’ Onofrio, 1993) concluded that it was the combination of the study habits and other factors that could explain students’ academic performance in any course of study. Adeyemo (2005) opined that study habit was a pattern of activity that went beyond merely reading for pleasure. According to him, it is a well planned and deliberate form of consistency on the part of the student towards the understanding academic subjects. Bakare (1977) in his study habit inventory pointed out eight key sources of poor academic achievement. Study habit problems associated with student’s response to home work and assignments; reading and note taking; time allocation; study period procedure; students’ concentration; towards examination and teachers’ consultation.

The inability to utilize effectively and positively these sources of study problems may stand in the way of effective study and good performance among the chemistry students. The practice, in most senior secondary schools in Nigeria, allows the students to perform experiment in a ‘cook-book’ fashion whereby students only follow direct instructions. The National Research Council (2002) also reported that students do not learn much from many laboratory activities and that the activities in many of them do not clearly connect to the rest of the class content or life outside class. With cook-book learning, students get the impression that only the final results and calculations matter (Alam, 2009a). Encouragements were not given by the teachers to the students to ask ‘why’ during the experiment. These could be ascribed in part to low abilities and poor academic standard of students. These are problems that necessitated this research. This study attempts to find out the extent, to which training in study or study habit behaviour could solve the achievement problem in chemistry especially in volumetric analysis.

**Research aim and research questions**

The study is designed to investigate students’ study habit and some physiological and psychological factors influencing their learning of volumetric analysis. This is done with a view to minimizing some difficulties and increasing the possibilities of learners’ involvement in the instructional process in volumetric analysis. In order to achieve this aim, the following research questions were raised:

(i) Would students’ study habit produce any significantly influence on their learning and attitudes towards volumetric analysis?

(ii) Would physiological and psychological problems produce any significant influence on students’ study habit towards the learning of volumetric analysis?

(iii) Would time management produce any significant influence on students’ study habit during practical activities in chemistry?

(iv) Would assigned homework have any significant influence on students’ study habit towards the learning of volumetric analysis?

(v) Would teachers’ consultation produce any significant impact on students’ study habit during chemistry practical lesson?

**Literature review**

**Definition of volumetric analysis**

Volumetric analysis is defined as the quantitative analysis of an unknown chemical solution by determining the amount of reagent of known concentration necessary to effect a reaction in a known volume of the solution (Webster’s New World College Dictionary). Much quantitative analysis (that is, analyzing the amount of substance present) is performed using reactions between two substances in solution. The volume and concentration of one solution is known and a titration method is used to find the exact volume of the second solution necessary to react completely with the first. The concentration of the second solution can then be determined if the equation for the reaction is known (http://www.nmenv.state.nm.us/swqbd/OUCP/WWLabstud yguide/introduction.pdf). In a general term, the volumetric analysis of acid-base reaction can be represented as:

\[
HA + OH^- \rightarrow H_2O + A^- \quad \text{or} \quad H^+ + OH^- \rightarrow H_2O
\]

Acid-base reaction in volumetric analysis is the commonest one in senior secondary school syllabus. This and other types are indicated in the Table 1.

Volumetric analysis was first introduced by Jean Baptiste Andre Dumas, a French chemist (Stillwater, 1999; Encyclopedia Britannica). He used it to determine the composition of nitrogen combined with other elements in organic compounds. Dumas burned a sample of a compound with known weight in a furnace under conditions that ensured the conversion of all nitrogen into elemental nitrogen gas. The nitrogen was carried from the furnace in a stream of carbon dioxide that was passed into a strong alkali solution, which absorbed the
Table 1. Type of redactions used in volumetric analysis.

<table>
<thead>
<tr>
<th>Reaction type</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
</table>
| Acid-Base     | H+ donor (acid) reacts with H+ acceptor (base). Indicator can be colored dye sensitive to acid/base or pH electrode. | a) Strong acid + strong base HCl(aq) + NaOH(aq) → H2O + NaCl(aq)  
   b) Weak acid + strong base CH3COOH(aq) + NaOH(aq) → CH3COONa(aq) + H2O  
   c) Weak base + strong acid CH3NH2(aq) + HCl(aq) → CH3NH3 + Cl⁻ (aq) + H2O |
| Precipitation | Reagent and analyte combine to form insoluble compound. Indicator can be colored reagent or electrode of some type. | a) soluble ionic compd 1 + soluble ionic compd 2 → insoluble ionic compound 3  
   NaCl(aq) + AgNO3(aq) → AgCl(s) + NaNO3(aq)  
   Complexation agent (ligand with multiple electron pairs to donate) + metal cation (O2C-CH2)2N-(CH2CO2)2 [called EDTA4⁻] → EDTA4⁻ + Ca²⁺ → [Ca(EDTA)]²⁺  
   Many types are possible. Some examples include  
   a) Ce⁴⁺ + Fe²⁺ → Ce³⁺ + Fe³⁺  
   b) MnO⁴⁻ + C₂O₄²⁻ (oxalate) → Mn²⁺ + CO₂ (not balanced) |
| Complexation  | Reagent and analyte form a coordination compound. Indicator can be a colored dye or electrode. |  |
| Redox         | Oxidation-Reduction (electron transfer). Indicator can be a colored dye or electrode. |  |

carbon dioxide and allowed the nitrogen to accumulate in a graduated tube. The mass of the nitrogen was then calculated from the volume it occupies under known conditions of temperature and pressure, and therefore, the proportion of nitrogen in the sample was determined. From then volumetric has been used widely in chemistry and industrial laboratories.

Volumetric analysis is a method of quantitative analysis using measurement of volumes. For gases, the main technique is in reacting or absorbing gases in graduated containers over mercury, and measuring the volume changes. For liquids, it involves titration. It can also be said to be a method of determining chemical differences and principles of redox (reduction-oxidation) reactions between molecules. Chemicals under this topic are classified based on the results obtained from titration. The process of creating a balance chemical equation ‘in vitro’ is called titration. It typically uses a volumetric flask, hence, the name, volumetric titration. There are three types of volumetric titration, which are classified based on the rate of their reaction. Direct titration method (DTM) is a one-step titration process. Indirect method (ITM) involves a two-step titration process. Back titration method (BTM) uses a three-step titration process.

The importance of volumetric analysis

The quantitative relationship between two reacting solutions is important to the chemists. Up to some point in chemical analysis involving solutions, solid precipitates of chemical reactions between such solutions were dried, separated and massed. The technique is called gravimetric analysis. It is used in quantitative experiments to determine mass relationships. The technique is useful but it is not always practically efficient. It is difficult and in many cases a waste of efforts and materials to separate and measure mass of products of a reaction while they are in solutions. Volumetric analysis looks a better and faster technique, especially if the substances involved are acids and bases. They can be titrated against one another for better quantitative results.

Volumetric analysis is used in high school, college and university chemistry laboratories to determine concentrations of unknown substances. The titrant (the known solution) is added to a known quantity of analyte (unknown solution) and a reaction takes place. Knowing the volume of the titrant allows the student to determine the concentration of the unknown substance (Nelson and Kemp, 1997). Medical laboratories and hospitals use automated titration equipment for basically the same purpose. Beside these, the process has found ample use in analytical laboratories; and drug, food and petrochemical industries. For example, in biodiesel industry, it is used to determine the acidity of a sample of vegetable oil. By knowing the precise amount of base that is needed to neutralize a sample of vegetable oil, scientists know how much base to add to neutralize the entire amount.

Volumetric analysis has also been used in space science in determining the presence of volatile component in the ejecta flow of crater cavity volume (Ackerman,
2005), in ecological study to determine the relationship between brain structure and sensory ecology of aquatic animals – teleost fishes (Lisney et al., 2007), in specialty metal application (Dulski, 1989), and in several other areas of scientific endeavors. It is an area of science that man can not do without as long as he wants to live a healthy and good life (Oloruntegbe and Alam, 2010).

**Correlation between habit and volumetric analysis**

Titrations are very common procedures held in secondary education to assess a chemistry student’s practical aptitudes (Basic Chemistry Lab, http://basicchemistrylab.blogspot.com/2009/10/particular-uses-of-titration-and.html). The unit comes under several labels such as quantitative analysis, mass-volume relationships, and volumetric practical work. It is an integral and compulsory unit for all high school chemistry students, and for undergraduates studying chemistry, biology, physics, and other applied sciences like biochemistry, microbiology, biotechnology, agricultural science, medicine, nursing and pharmacy. These groups of students must possess the foundational experience from the secondary level.

Several factors have been found to account for students’ performance in chemistry. Okebukola (1988) identified twelve of them. These factors according to Okebukola (1988) accounted for 64% of the variance of students’ score in practical chemistry when stepwise multiple regression analysis was applied on data collected. Students’ participation in laboratory activities made the greatest independent contribution to variance in performance, followed by students’ attitudes to chemistry as a subject. Other related factors are teachers’ attitude to chemistry laboratory work and availability of chemistry laboratory materials. Students’ attitudes were also found to be in part of a product of physiological and psychological factors. It can be seen from the work cited that, a lot of factors could be responsible for students’ performance, high or poor. As far as habits or attitudes are concerned, whatever students’ dispositions that enhance their performance could be determined by the level of interest they show towards every activity embedded in the course? Hofstein and Lunetta (1982; 2002) just as corroborated by Derek (2007) suggest that laboratory activities have potential to enhance cognitive growth, positive attitudes as well as social relationships among peers. A few studies have revealed students’ positive attitudes towards practical work including volumetric analysis (Regan and Childs, 2003; Derek, 2007). Derek (2007) male sample showed a decline attitude as they advance in grade, but no such decline was noticed in females. On the other hand, there are studies that revealed students’ boredom (Cashell, 1999; Reid and Skryabina, 2002). These changes in attitudes were in turn traced to teachers’ dispositions towards helping and motivating the students and also to availability of laboratory facilities (Regan and Childs, 2003).

Regan and Childs (2003) observed that when students were regularly engaged in practical activities they tend to have enhanced interest, but as the frequency slowed down to no laboratory activities for weeks, the interest also went down. Reasons why students could not be engaged regularly in laboratory activities were included in Okebukola (1986) twelve factors. Morgil et al. (2007) also submit that activities in many laboratories centered on verification of what is already known (titration in particular) rather than helping students to develop process skills that could motivate them to stay longer at task. On the other hand, the National Research Council (2002) also reported that students do not learn much from many laboratory activities and that the activities in many of them do not clearly connect to the rest of the class content or life outside classroom. According to Morgil et al. (2009) “Drill and practice” is applied to train students to pass practical examination. Teachers and students place great emphasis on obtaining the correctness of the answers. The mastery of process skills is normally left to chance. Experientially, this suggests why many students just work to already given answer without concentrating much on the titrations which the teachers teach to test them (World Bank, 2007). Such students will have nothing much to fall back on as home assignment. The result is poor study habit noticed in many students.

In most of the times, teachers are under constraint in that their choice of approaches or whether to engage students in laboratory work or not are sometimes determined by availability of teaching facilities and flexibility of timetable schedule among other factors. Laboratories in many schools, particularly in the developing nations are just there in name (Schneegans, 2003). They are devoid of facilities and equipment for routine hands-on activities. Even in wealthy nations these hands-on laboratory activities are being replaced with virtual substitutes such as computer-based simulations and video sequences (Kunle and Alam, 2010a, 2010b). This coupled with rigid timetable scheduling make many teachers to resort to theoretical approach. Observation reveals that the next subject teacher will be standing at the door at the expiration of the 40 minutes or one hour period as the case may be. Teachers would only visit the laboratory for practicals with the approach of externally conducted examinations and for what Hudson (1993) and Choi and Nam (1995) criticized for lack of ‘thought out’ or ‘stereotype’ purpose.

**METHODS**

**Sample**

The population of this study comprised all senior secondary two chemistry students in the public senior secondary schools in Ondo State. The choice of SSII students is considered appropriate because the students have been exposed to some basic chemistry concept in volumetric analysis. Of the population a total number of two hundred and forty were randomly selected from six senior
secondary schools in Akure South Local Government Area of Ondo State. The schools as well as the students in each school were selected using systematic random sampling technique with the aid of list of schools obtained from the Ministry of Education and class registers respectively. The subjects were good representative of the population being randomly selected.

**Instrument**

The researcher adapted the study habit inventory prepared by Bakare,(1977) with a reliability coefficient of 0.83 for his study. The SHQ consisted of two section, A and B. Section A which deals with the personal data of the subjects while section B is in turn made of five parts. Each of the parts contained items that deal with the main sources of students’ study habit problems toward the learning of volumetric analysis in chemistry. The responses to each of the item were described as follows scored on 4-point Likert Scale of Never (N), Sometimes (S), Usually (U) Always (A). In an attempt to establish the validity of the adapted study habit inventory, experts who were researchers in this area scrutinized the contents of the instruments. They gave their expert advice in respect of the language level, the appropriateness and the overall face validity of the instrument. The adapted study habits inventory was administered twice (test-retest) on forty five (45) SSII chemistry students which were within the population but outside the study sample within an interval of two weeks. The two set of scores were correlated using Pearson’s Product Moment Correlation formula. The calculated reliability coefficient of 0.64 was obtained. The authors wish to acknowledge the limitation of the instrument employed in this study. Though the coefficient of reliability obtained was a bit low; experts in test and measurement (Kaplan, 2001 and Nunnely, 1978) agree that such value indicate positive correlation and is acceptable for research purposes.

After the validation of the questionnaire had been ascertained, fresh copies of the questionnaire were administered by the researchers on the sampled respondents and the completed questionnaire were collated for data analysis. The data collected were analyzed using frequency counts and chi-square. The choice of the statistical tool (non-parametric, chi square for goodness of fit) employed here was informed by the type data collected being ordinal. It is also a statistic suitable for analyzing relationship involving two of more factors. The five hypotheses raised were tested at 0.05 levels of significance.

**ANSWERS FOR RESEARCH QUESTIONS**

The results of the study were presented in tables as follows:

(i) Research issue 1: Significant influence on students’ reading habit towards the learning of volumetric analysis. Table 2 above shows that, reading habit has a significant influence on students’ behaviour towards practical lesson in chemistry. This is so, because the $X^2_{\text{cal}}$ (63.45) is greater than $X^2_{\text{table}}$ value (1.75) at 0.05 level of significance. Thus, it suggests that the reading habit of the students in chemistry texts may have significant influence on students’ study behavior towards the learning of volumetric analysis.

Table 2. Summary of students’ responses with respect to reading habit in volumetric analysis.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>N</th>
<th>S</th>
<th>U</th>
<th>AL</th>
<th>$X^2_{\text{cal}}$</th>
<th>$X^2_{\text{table}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>During practical lesson, do you take time to read chemistry practical manual?</td>
<td>24</td>
<td>44</td>
<td>118</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>In reading chemistry text, do you tend to write things which later turn out to be important?</td>
<td>26</td>
<td>48</td>
<td>112</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>After reading the chemistry practical manual, do you find the concept of titration easy to understand and remember what you have just read</td>
<td>16</td>
<td>88</td>
<td>80</td>
<td>56</td>
<td>63.45</td>
<td>1.75</td>
</tr>
<tr>
<td>4</td>
<td>Do you go back and recite to yourself the material read/ studied, rechecking any points you find doubtful?</td>
<td>22</td>
<td>28</td>
<td>130</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are you able to read the level of meniscus (initial and final reading) during titration?</td>
<td>28</td>
<td>50</td>
<td>88</td>
<td>74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$p < 0.05$

(ii) Research Issue 2: Influence of physiological and psychological problems on students’ study habit during practical lesson. Table 3 shows that the chi-square

Table 3. Responses of the students towards the learning of volumetric analysis with respect to their physiological and psychological problems.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>N</th>
<th>S</th>
<th>U</th>
<th>AL</th>
<th>$X^2_{\text{cal}}$</th>
<th>$X^2_{\text{table}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Do you have problem in sight-reading?</td>
<td>120</td>
<td>60</td>
<td>50</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Do broken homes, stress or hardship or inability to buy science materials causes you to neglect your practical work?</td>
<td>84</td>
<td>70</td>
<td>52</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Do you get nervous and confused when pouring acid into the given burette?</td>
<td>112</td>
<td>96</td>
<td>18</td>
<td>14</td>
<td>79.10</td>
<td>1.88</td>
</tr>
<tr>
<td>4</td>
<td>Do you have problem of expressing what you see or hear or smell during the individual practical work?</td>
<td>54</td>
<td>120</td>
<td>48</td>
<td>18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$p < 0.05$
### Table 4. Summary of the students’ responses with respect to time management in the learning of volumetric analysis.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>N</th>
<th>S</th>
<th>U</th>
<th>AL</th>
<th>$X^2_{cal}$</th>
<th>$X^2_{table}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Do you have much time for yourself to study operational procedures and precautions during titration?</td>
<td>2</td>
<td>30</td>
<td>92</td>
<td>116</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Do you plan your work so that you will make the best use of your time?</td>
<td>8</td>
<td>58</td>
<td>120</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Do you spend too much time on chemistry practical work and little on other subjects?</td>
<td>12</td>
<td>64</td>
<td>104</td>
<td>50</td>
<td>78.22</td>
<td>1.75</td>
</tr>
<tr>
<td>4.</td>
<td>Do you study for at least three hours each week after teacher discussion in the laboratory?</td>
<td>6</td>
<td>54</td>
<td>96</td>
<td>84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Are you able to finish the practical work within the time allowed during the practical period?</td>
<td>30</td>
<td>70</td>
<td>80</td>
<td>60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$P < 0.05$

### Table 5. Summary of the students’ responses on the influence of assignment and homework on students learning habit in practical chemistry.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>N</th>
<th>S</th>
<th>U</th>
<th>AL</th>
<th>$X^2_{cal}$</th>
<th>$X^2_{table}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Do you begin your assignment as soon as the teacher gives them to you not allow them to pile up?</td>
<td>4</td>
<td>60</td>
<td>122</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>When your assigned home work is too long and hard, do you stick to it until is completed?</td>
<td>5</td>
<td>70</td>
<td>115</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Do you correct errors on your practical note book which your teacher have marked and returned to you?</td>
<td>10</td>
<td>50</td>
<td>80</td>
<td>100</td>
<td>78.22</td>
<td>1.88</td>
</tr>
<tr>
<td>4.</td>
<td>If you have to be absent from practical work, do you make up missed lessons and assignment immediately?</td>
<td>18</td>
<td>24</td>
<td>96</td>
<td>102</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$p < 0.05$

### Table 6. Summary of students’ responses to teacher consultation during practical lesson.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>N</th>
<th>S</th>
<th>U</th>
<th>AL</th>
<th>$X^2_{cal}$</th>
<th>$X^2_{table}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>When you are having problem in acid-base titration, do you try to discuss it with the teacher?</td>
<td>20</td>
<td>60</td>
<td>104</td>
<td>56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Do you hesitate to ask your teacher for further explanation on the points that are not clear to you?</td>
<td>5</td>
<td>30</td>
<td>130</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Do you teacher criticize your written work for being hurriedly written?</td>
<td>70</td>
<td>50</td>
<td>80</td>
<td>40</td>
<td>128.31</td>
<td>2.10</td>
</tr>
</tbody>
</table>

$P < 0.05$

The calculated value (79.10) is greater than the table value (1.88). This implies that physiological and psychological problems experienced by the subjects like effects of broken homes, stress, or hardship from much engagement in chores and inability to see or hear or smell during individual practical work have a significance impact on students’ study behavior towards the learning of volumetric analysis.

(iii) Research Issue 3: Influence of time management on students’ study habit in practical activities in chemistry. Table 4 above shows that time management has a significant influence on students’ study habit. This is so because the $X^2_{cal}$ (78.22) is greater than $X^2_{table}$ value (1.75) at 0.05 level of significance. Thus, this suggests that proper time management in learning scientific concepts could generate students’ interest and good orientation towards the learning of volumetric analysis.

(iv) Research Issue 4: Influence of assigned homework does on students’ study habit towards the learning of volumetric analysis. The result in Table 5 shows that the chi-square calculated value (78.22) is greater than the table value (1.88) at 0.05 levels of significance. Thus, it could be seen from the students’ responses that assigned homework has significant influence on students study habit.

(v) Research issue 5: Impact teachers’ consultation on students’ study habit during practical lesson in chemistry. Table 6 above shows that teachers’ consultation has a
significant impact when students were exposed to practical activities in chemistry. This is so because the chi-square calculated value (128.31) is greater than the table value of (2.10). Hence, hypothesis 4 is rejected. It suggests that teacher could be an active mentor during the instructional process.

**DISCUSSION**

The findings of this study have demonstrated clear pattern of reading habit on students’ study behaviour towards the learning of volumetric analysis. The result in Table 1 obtained indicated that reading skill has significant influence on students’ study behaviour in chemistry. The results agreed with the findings of Seweje and Idiga (2003) who reported that achievement of students in science depended on the student’s personal efforts toward the reading of scientific concept meaningfully. This could also be attributed to the fact that students might have masters and be able to read some chemical languages effectively. This is so because students might have probably understood basic operation in titration and taken part in laboratory discussion and activities. It could be seen from the overall results of this study that the main sources of study problems were students’ responses to assigned homework, time allocation, studied period, note-taking and teachers’ consultation, as well as home-related problems which distracted students’ attention from concentrating on their studies. Study by Oloruntegbe and Ikpe (2009) submitted that students, particularly from low-income homes are usually seen as sources of additional income. Engaging students in chores, in market and in gardening, though a distraction from study, but could earn compensation if the parents help them to learn science while doing chores.

In another study they (Oloruntegbe and Ikpe, 2009) gave some consolidating and complementary home activities and chemistry concepts like filtration, decantation, making solutions that could be additional compensation from science learned in the kitchen. The problem is that most of the times, parents have no time and are not proficient in science to offer the needed assistance that could help students connect school science with home activities. Many teachers also failed to establish this connection because students reported that many of them do not cite home examples and illustrations in their chemistry teaching (Oloruntegbe and Ikpe, 2009). This further lowers students’ motivation and interest in science, hence often reported poor performance.

The results obtained in Tables 3 - 5 show that, there is significant influence of these study problems on the study habit of students toward the learning of volumetric analysis in chemistry. However, this finding is in line with Ogunmakin (2001); Bassey (2002) who argued that study habits could influence academic performance of learners. De Escobar (2009), Riaz et al. (2002) equally agree that good study habits and academic achievement walk hand in hand. This could also be linked with one or a few of the twelve factors of Okebukola (1986). The subjects of this study might have gone through series of long periods of practical lesson in volumetric analysis.

**Conclusion**

Based on the findings, one could conclude that the students’ interest in chemistry, particularly volumetric (quantitative) analysis, and hence, their performances in chemistry are dependent on good study habit and are determined by some physiological and psychological variables. Conscious understanding of these problems and alleviating them will go a long way to help students generate interest, attitude and ultimate success in the learning of chemistry. Chemistry teachers need proper exposure and orientation to these basic physiological and psychological study problems of students. They also need to understand and monitor student’s developmental and intellectual progress so as to be aware of the exact approaches to employ in helping them. Hence, there is a need to organize workshops and seminars for teachers where the relevance of study habits problems and behaviour towards practical activities would be stressed.

**REFERENCES**


Bakare M (1977). Study Habits Inventory (SHI), Ibadan Education Research Production Psychology.


