A CORRELATIONAL STUDY OF STUDENTS' ATTITUDE AND ACHIEVEMENT IN CHEMISTRY WITH TEACHER CLASSROOM MANAGEMENT BEHAVIOURS

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Abstract

In science teaching and learning, the teacher is seen as playing the crucial role of harnessing all resources and evoking students' activity for classroom success. This study investigated students' attitude and achievement in Chemistry as a correlate of teacher classroom management behaviours (TCMB). A random sample of SSII chemistry students and teachers were selected from ten secondary Schools in Ibadan North L.G.A of Oyo State. A sample size of 60 students and 10 teachers were selected. Data were collected using direct-observation instruments and questionnaires. Pearson product moment coefficient was used to test the null hypothesis for significance at 0.05 error margin. On the average, TCMB was found to have no significant correlation with attitude and achievement. However, the TCMB categories: "Interest boosting", "Student involvement" and "Varying instruction" were found to have a strong, positive and significant correlation achievement in chemistry ($r = .637, .641, .648$ respectively; $p < 0.05$). The implications for policy formulation, teacher training, teaching and learning in science education were discussed.

Introduction

Quality of education has been the focus of discourses and reforms in education, globally. In Nigeria, the recent review of the state of the education sector highlighted 'standards and quality assurance' as one of the four areas of focus. Increased investment in infrastructure; teacher quality, motivation and retention; curriculum relevance and review; learner support services; and ICT are seen as the prerequisite for achieving high performing schools and high achieving students. At the classroom level, greater attention is being paid to process-variables, such as teacher and student behaviours, as determinants of quality and quantity of teaching and learning. In science teaching and learning, considering the nature and content of science as well as the classroom environment, the teacher is seen as playing the crucial role of harnessing all resources and evoking student activity for classroom success (Gbamanja, 1997).

Several studies have been undertaken on the aspect of the role of the classroom teacher in achieving quality in school (Akubue, 1991; Cangelosi, 2000; and Huitt, 1999). Akubue (1991) identified 'instructional' and 'management' roles of the teacher, and Huitt (1999) added 'planning' to them (Fig. 1). Teacher's instructional roles include all his preoccupation with content matter/lessons – his guiding student's learning of lesson content; while his management roles include the establishment of a suitable learning climate and harnessing all resources for the fulfillment of educational goals and objectives.

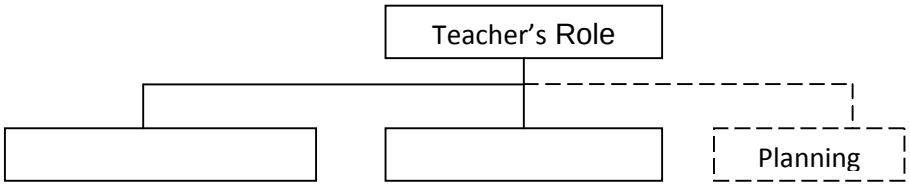

Fig. 1: A model of teacher's role

Studies (Cangelosi, 2000; Doyle's, 1986 in Miller & Hall, 2005; and Waggins, 2003) have described strategies for classroom management. Cangelosi (2000) suggested 'designing and conducting engaging learning activities' as a managerial strategy along with confronting discipline problems. According to Doyle (1986) in Miller and Hall (2009), classroom management results in the coupling of order and learning. It includes strategies teachers utilize to promote order and student engagement and learning. The strategies are categorized into motivation, prevention, and reaction.

Waggins (2003) categorized classroom management into preventive, maintenance, supportive and corrective discipline/management and offered techniques for each. According to him, preventive discipline/management skills involved: assessing, clarifying, and communicating needs and expectations of both teachers and students; creating a warm and nurturing classroom climate; democratically developing a set of rules and consequences; developing a daily routine, yet remaining flexible; making learning more attractive and fun for the student. While, supportive and corrective discipline/management techniques involved dealing with misbehaviour, quickly, consistently, and respectfully; when all else fails, respectfully removing the student from the class.

Kounin (1970) in Dunbar (2004) kindled interest in the significance of classroom management. He studied on group responses to a reprimand directed at an individual (ripple effect) and discipline. According to him, effective classroom management techniques included:

(i) Showing your students you are "with it" – "withitness" (communicating to students that you are aware of everything that is happening in the classroom that you are not missing anything);

(ii) Learning to cope with overlapping situations (keeping track of and supervising several activities at the same time);

(iii) Striving to maintain smoothness and momentum in class activities;

(iv) Trying to keep the whole class involved, even when you are dealing with individual pupils;

(v) Introducing variety, and being enthusiastic, particularly with younger pupils; and

(vi) Being aware of the ripple effect (when criticizing student behaviour, be clear, firm, focus on behaviour rather than personalities and try to avoid anger outbursts).

Management in the Science Classroom

The nature of science, science classroom, and instructional/teaching styles in science bear great implication for classroom management. Capie and Tobin (1981) in Newton and Newton (2011) asserted that the way the science teacher manages the classroom significantly affects the climate, motivation, and goal achievement in their classrooms. They referred to the effective classroom managers as teachers who have clear expectations/goals and communicate them to students; and maintain smooth transitions within lessons. Management in Science teaching-learning requires multi-dimensions task: managing the unique nature of the science subject (processes, procedures, products of science); handling and managing students' behaviours; arranging and improvising materials, resources for science learning; and managing learning time, laboratory design and controlling hazards.

Cangelosi (2000) suggested the design and conduct of different learning activities for different class sessions as a way of gaining and maintaining/managing students' cooperation. Clear directions for behaviour, advanced organizers to direct students' thinking, signals (especially non-verbal ones) stimuli variation, voice volume modulation, audio-visual aids, humor, eye contacts, frequent student monitoring, deliberate movements increase student task engagement in lecture-like science teaching. Similarly, Huitt (1999) emphasized the importance of indirect or democratic styles to foster on-taskness and achievement in science. Classroom in which the teacher exhibited non-directive and non-valuative behaviours appeared to make students more independent and activity-oriented in the science problem situation (Ikujuni, 1995). Also, modified mastery learning strategy (a science instructional management) positively relates with achievement and attitude, and on-task behaviour of chemistry students (Padilla, Okey & Dillashow, 1983).

In the science classroom, instructional, resource and behaviour management is inevitable. According to Gbamanja (1997), the set-backs in science learning in Nigeria (as with most developing countries) is traceable to the effects of teacher behaviours. He lamented the declining performance of science students despite various governmental/institutional efforts and curriculum reforms.

Objective of the Study

This study sought to ascertain the relationship between teacher management behaviours and students' achievement in and attitude towards Chemistry. It considered teacher management behaviours as the observable teacher actions in establishing a suitable teaching-learning climate and harnessing resources for the fulfillment of educational goals and objectives.

Specifically, the study sought the relationship between attitude and achievement in chemistry with each of the 12 identified management behaviours: 'With-it-ness', 'Interest boosting', 'Sociation', 'Students' involvement', 'Order', 'Proximal control', 'Smoothness of lesson Transition and momentum', 'Varying Instruction', 'Concurrent Dealings', 'Waiting', 'Non-Verbal', and 'Others' [detailed in appendix II].

Research questions

The following questions guided the study:

1. How is science students' achievement in chemistry correlated with teacher's classroom management behaviours?
2. How is students' attitude toward chemistry correlated with teacher's classroom management behaviours?

Hypotheses

The following hypotheses were tested in the study:

Ho_1: There is no significant correlation between teacher classroom management behaviours and students' achievement in chemistry.

Ho_2: There is no significant correlation between teacher classroom management behaviours and students' attitude in chemistry.

Methodology

Research Design: The study used correlation design. This allowed the researcher to ascertain if there were any relationship between the variables; how strong the relationship; and the direction of the relationship. The study was not concerned with cause-effects relationship.

Sample and Sampling Techniques: The study involved 10 chemistry teachers (1 per school) and 60 science students. They were drawn from 10 randomly selected public schools in Ibadan North L.G.A of Oyo State (Nigeria) which offered chemistry at the SSII level. In each selected school, an intact classroom was studied; however, only 6 students in the class were used for the study [which is part of a larger and detailed classroom observational study]. School aptitude/achievement records ensured that the six selected students were representative of the class in terms of attitude and achievement in chemistry.

Instrumentation: Data collection procedure involved direct classroom observation and the use of questionnaires. The instruments used include: Teacher Management Behaviour Observation schedule (TMBOS); Chemistry Achievement Test (CAT); and Chemistry Attitude Questionnaire (CAQ).

The TMBOS (Appendix I) is split into intervals (time units of 3 minutes). During the lesson period, the observer focused on the teacher for 60s at 3minutes intervals to observe manifestation of the management behaviours (Appendix II). Any behaviour(s) displayed within the 60s received tally/tallies. No behaviour was entered more than once in same minute. The TMBOS was validated by science education experts. Its reliability was determined by having two observers simultaneously observing and scoring the TMBOS for same lesson; the inter-raters reliability coefficient was estimated at 0.66.

The Student Chemistry Achievement Test (CAT), a 30-item objective test, was administered to the students (N=60) at the end of the classroom observation session. The 4-option objective questions covered the topics: Acids, Bases, Salts and Carbon/Carbon Compounds [the topics covered by the teachers at the study period]. Science Education experts subjected the test to face validation; while

test blueprint ensured content validity. A test-retest reliability coefficient of 0.72 was obtained for the CAT. This was calculated using 25 students who took, at two weeks intervals, two versions of the same test with test items rearranged [the two sets of scores were compared].

The Chemistry Attitude Questionnaire (CAQ) comprised a 30-item scale with 4-point loading ranging from strongly Agreed (SD) to strongly Disagreed (SD). It gave a Crombach alpha reliability coefficient of 0.68. The CAQ specification include statements on: 'Likeness for chemistry', 'Emotional climate of the chemistry classroom', 'Chemistry curriculum', 'Chemistry teacher', 'Physical environment of the chemistry classroom/laboratory', 'Friends' attitude towards chemistry', 'Achievement motivation', 'anxiety', and 'Chemistry self-concept'. Experts in science education provided face validation for it.

Procedure for Data Collection and Analysis

The researcher, with the consent of the school heads, visited the schools and observed intact classroom lessons in chemistry. Same topics: Acid, Base, Salt, and Carbon/Carbon Compounds, were taught across the classes/schools observed. These topics were already in the SSII science curriculum for the term. During the 45 min lesson, the researcher chose appropriate non-interrupting position in the classroom. He focused on the teacher for 60s at 3minutes intervals to observe manifestation of the management behaviours (detailed in Appendix II). Any behaviour(s) displayed within the 60s received tally/tallies on the TMBOS. No behaviour was entered more than once in same minute.

Each teacher was observed three times for the research (at least once each week) for a period of 4 - 6 weeks. Only the researcher observed and scored the TMBOS to ensured uniform scoring across the selected schools. Data from the continuously coded observation schedule were analyzed using Pearson product moment correlation. Similarly, the student questionnaires (CAT & CAQ), which were given and collected during the last week of observation, were analyzed using Pearson product moment correlation and other simple descriptive statistical tools [specifically, SPSS 15.0 for Windows software was used; raw scores for TCMB, CAT and CAQ for each class is provided in appendix 1b].

To facilitate analysis, TCMB is treated individually and as composite. That is, for each teacher, T_1 – T_{10}, individual scores for each of the 12 behaviour categories are entered along with the sum of the score (see appendix 1b for variable 'Total TCMB'). The ½ max scores expected of 'individual TCMB' and 'Total TCMB' are 8 and 96 respectively for the 46 min class (60s observation taken at 3min intervals). Averages of achievement and attitude are compared with 'individual TCMBs' and 'Total TCMB' for each teacher.

Results

$H0_1$ There is no significant correlation between teacher classroom management behaviours and students' achievement in chemistry. Table 1 presents the Pearson's correlation analysis between TCMB (Total) and achievement; while table 2 presents the correlation between achievement and the 12 categories of TCMB (individual TCMB).

Table 1: Correlations analysis for 'Total TCMB' and 'Achievement'

		Total TCMB	ACHIEVT
Total TCMB	Pearson Correlation	1	.411
	Sig. (2-tailed)		.238
	N	10	10
ACHIEVT	Pearson Correlation	.411	1
	Sig. (2-tailed)	.238	
	N	10	10

As shown in table 1, no significant correlation was found between 'total TCMB' and 'Achievement' ($r = .411$; $p < .05$). Therefore, the Ho_1 is not rejected. That is, on the total, the teacher's classroom management behaviour was found to have no significant correlation with achievement. Insights on the individual contributions of the 12 categories of teacher classroom management behaviours are shown in table 2.

Table 2: Correlation analysis for 'Achievement' and 12 'VAR' Variables (WIT, INT, SOC, STU, ORD, PRO, SMO, VAR, CON, WAI, NON, & 0TH)

		WIT	INT	SOC	STU	ORD	PRO
ACHIEVT	Pearson Correlation	.225	.637(*)	.285	.641(*)	.039	.214
	Sig. (2-tailed)	.532	.047	.425	.046	.915	.552
	N	10	10	10	10	10	10
		SMO	VAR	CON	WAI	NON	OTH
ACHIEVT	Pearson Correlation	.360	.648(*)	.194	.212	.075	-.794(**)
	Sig. (2-tailed)	.307	.043	.592	.556	.836	.006
	N	10	10	10	10	10	10

* r is significant at .05 level; ** r is significant at .01 level (2-tailed)

Table 2 reveals that 'INT' (Interest Boosting), 'STU' (Student Involvement) and 'VAR' (Varying Instruction) had significant positive correlation with achievement ($r = .637, .641, .648$ respectively; $p < 0.05$). 'OTH' (Others) had a significant but negative correlation with achievement. Only 4 out of the 12 TCMBs were significantly correlated with achievement [more than half of the TCMBs (8) had no significant correlation with achievement]. Therefore, Ho_1 is not rejected.

$H0_2$ There is no significant correlation between teacher classroom management behaviours and students' attitudes toward chemistry. Table 3 presents the Pearson's correlation analysis between TCMB (Total) and achievement; while table 2 presents the correlation between achievement and the 12 categories of TCMB (individual TCMB).

Table 3: Correlation analysis for 'Total TCMB' and 'Attitude'

		Total TCMB	ATTITUDE
Total TCMB	Pearson Correlation	1	-.339
	Sig. (2-tailed)		.338
	N	10	10
ATTITUDE	Pearson Correlation	-.339	1
	Sig. (2-tailed)	.338	
	N	10	10

Table 4: Correlation analysis for 'Attitude' and 12 'VAR' Variables (WIT, INT, SOC, STU, ORD, PRO, SMO, VAR, CON, WAI, NON, & 0TH)

		WIT	INT	SOC	STU	ORD	PRO
ATTITUDE	Pearson Correlation	-.680(*)	-.378	-.085	-.054	-.098	-.608
	Sig. (2-tailed)	.031	.282	.814	.882	.787	.062
	N	10	10	10	10	10	10
		SMO	VAR	CON	WAI	NON	OTH
ATTITUDE	Pearson Correlation	-.270	-.028	-.049	-.017	-.137	.115
	Sig. (2-tailed)	.450	.939	.893	.962	.706	.753
	N	10	10	10	10	10	10

* Correlation is significant at the 0.05 level (2-tailed)

Table 3 shows a moderate negative but insignificant correlation between Total TCMB and Attitude ($r = -.339$; $p < 0.05$). Also, table 4 shows that all but one ('WIT': $r = -.680$) of the management behaviours categories have no significant correlation with Attitude towards Chemistry. Therefore, the Ho_2 is not rejected.

Discussion

The findings (table 1 & 4) revealed that taken holistically, teacher management behaviours bear no correlation with achievement and attitude. This is quite contrary to the findings from some studies (Capie & Tobin, 1981 in Newton & Newton, 2011, & Huitt, 1999) which appraise the role of teacher classroom management in school success. It is worth mentioning however, that these studies isolated and studied only aspects of teacher management behaviours. Thus, table 2 and 4 give illustration and insight into the correlation of 12 specific classroom management behaviours of teachers with chemistry achievement and attitude.

Table 2 reveals that teacher management behaviours of 'Interest Boosting', 'Student Involvement' and 'Varying Instruction' were positively and significantly correlated with achievement in chemistry. This revelation implies that student achievement in chemistry is significantly increased when teachers increasingly boost students' interests, vary instructional procedures and get students involved in the teaching–learning transaction. This agreed with the findings of Cangelosi (2000), and Tobin and Capie (1981) in Newton and Newton (2011) that teacher effective instructional management impact student achievement positively.

Table 2 also revealed a significant, but negative correlation between teachers other non-managerial behaviours ("OTH") and Students Achievement in Chemistry ($r = -0.81$; $p<0.05$). This implies that some teacher behaviours (non-managerial) can actually have negative impact on students' achievement in chemistry. For example, "too much control" can hamper attitude and achievement in chemistry. Thus, Huitt (1999) emphasized the importance of indirect or democratic styles to foster on-taskness and achievement in science.

The Ho_2 is supported by the result presented in table 3 & 4. They show an overall weak, insignificant relationship between the teacher management behaviours and students' attitude toward chemistry. This means that any pattern in student attitude observed was a chance occurrence and not necessarily the result of particular teacher management behaviours. A discrepancy in the pattern is however observed in the relationship between 'Attitude' and 'WITH' variable; a significant strongly negative correlation was found implying that teacher's exhibition of "with-it-ness" (often perceived by students as policing behaviour) tends to lower students' attitude towards chemistry effect. This observation was also made by Cangelosi (2000).

The study results (appendix 1b) also give hint on the teachers' classroom management behaviours for each class. While, the ½ *maximum expected* score for the individual TCMBs is 8, only few *obtained scores* (16 scores out of 120) were more than the half maximum expected. This means that, the study observed an overall low manifestation of classroom management behaviours by teachers. This has great implication for the theory, practice and research in science teaching and learning.

It is therefore recommended that:

(i) Interest boosting', 'Student Involvement' and 'Varying Instruction' should be emphasized as they increase achievement in chemistry. Issuance of commands and orders by teachers should be infrequent as such behaviours negatively affect students' attitude towards chemistry.

(ii) Teachers should be aware of the different management styles, their relative strengths and weaknesses, so they can adopt suitable management styles in different science classroom sessions. Democratic styles of classroom management should be appraised alongside maintenance management.

(iii) Pre-service and servicing teachers should be trained in and exposed to the different categories of management behaviours to improve on their classroom practices.

(iv) Teacher classroom effectiveness (including high student achievement and attitude) should be the goal of teacher appraisal and training programmes.

(v) Researchers in science education should build upon the study by isolating individual management behaviours observed to have significant correlation with achievement in chemistry with the view of establishing a cause-effect relationship; also studies further should be conducted in the area of developing effective management strategies for science classroom sessions.

Conclusion

The instructional as well as managerial roles of the teacher are critical to classroom success and quality in education. Therefore, as the study suggests, teachers and teacher trainers should pay more attention to the development and promotion of the classroom management behaviours that positively relate to students' outcomes in chemistry. Specifically, 'Interest Boosting', 'Student Involvement' and 'Varying Instruction' should be emphasized in science classrooms as they are found to increase achievement.

References

Akabue, A. U. (1991). *Classroom organization and management: A 5-point strategy.* Ibadan: Wisdom.

Cangelosi, J. S. (2000). *Classroom management strategies: gaining and maintaining students' cooperation* (4th ed.). New York, NY: John Wiley & Sons.

Dunbar, C. (2004). *Best practices in classroom management*. Retrieved from https://www.msu.edu/~dunbarc/dunbar3.pdf

Gbamanja, S. P. T. (1997). *Curriculum development and implementation: New strategies for years 2000 plus*. Port-Harcourt: Para Graphics.

Huitt, W. (1999). *Classroom management: Educational psychology interactive.* Retrieved from http://chiron.valdosta.edu/whuitt/edpsyc/firstwk.html

Ikujuni, J. A. (1995). *Effects of classroom instructional management strategies on reading performance of learning disabled children* (Unpublished doctorial dissertation). University of Ibadan, Ibadan.

Miller, G. & Hall, T. (2009). *Classroom management*. Retrieved from http://aim.cast.org/learn/historyarchive/backgroundpapers/classroom_managemet

Newton, P. D. & Newton, D. L. (2011). Engaging science: Pre-service school teachers' notion of engaging science lesson. *International Journal of Science and Mathematics Education, 9* (2), 327 - 345.

Padilla, M. J., Okey, J. R. & Dillashow, F. D. (1983). The relationship between science process skill and formal thinking abilities. *Journal of Research in Science Teaching, 20 (3), 239 – 246.*

Wiggins, D. (2003). *Classroom management plan*. A paper of the Mathematics Education, University of Minnesota. Retrieved from http://www.geom.uluc.edu/~dwiggins/ plan.html

APPENDIX I

Teacher's Management Behaviour Observation Schedule (TMBOS)

Name of School: _____ *Name of Teacher:* _____

Class Level: _____ *Size:* _____ *Mean Age:* _____
Topic: _____ Period (lesson duration): _____

Time(MIN)→ Interval category ↓	**1**	**4**	**7**	**10**	**13**	**16**	**19**	**22**	**25**	**28**	**31**	**34**	**37**	**40**	**43**	**46**	**Total**
WIT																	
INT																	
SOC																	
STU																	
ORD																	
PRO																	
SMO																	
VAR																	
CON																	
WAI																	
NON																	
OTH																	
TOTAL																	

APPENDIX I B:

Raw class scores for: Total TCMB; 2 'WIT' Variables (ACHIVT & ATTITUDE); and 12 'VAR' Variables (WIT, INT, SOC, STU, ORD, PRO, SMO, VAR, CON, WAI, NON, & OTH)

	WIT	INT	SOC	STU	ORD	PRO	SMO	VAR	CON	WAI	NON	OTH	Total TCMB (1/2 max=96)	AVE.ACHIEVT (1/2 max=15)	AVE.ATTITUDE
T1	1	8*	2	6	7	3	9*	5	1	1	1	0	44	15	90.7
T2	0	8*	1	5	5	2	9*	2	1	0	0	0	33	14	94.8
T3	1	8*	3	8*	5	6	12*	4	5	4	1	0	57	13	94.8
T4	0	7	1	5	5	2	1	2	1	0	0	0	24	13	89.5
T5	2	9*	3	6	6	8*	10*	3	2	1	1	0	51	12	9.5
T6	1	8*	2	7	3	4	10*	3	2	2	3	0	45	9	90.2
T7	0	8*	1	5	5	7	6	4	1	0	0	0	37	12	91
T8	1	9*	7	7	7	3	2	3	2	0	0	0	41	12	96.3
T9	0	6	0	1	7	1	3	0	0	0	0	6	24	5	91.7
T10	1	9*	3	7	6	4	10*	3	1	2	2	0	48	16	83.3

*Scores > ½ Max expected score of 8

Appendix II

TEACHER'S MANAGEMENT BEHAVIOUR (TMB) CATEGORY*

Teacher Overt Management behaviours	*Characteristics*
Withitness (WIT)	Teacher's proactive statement or behaviour which sends message to students that he is aware of what is happening at all times and in all areas of the classroom. Actions/behaviours that cut-off, prevent occurrence of anticipated misbehaviour; communicating "awareness", "control", "inchargeness" and "alertness"/"vigilant eye".
Interest boosting (INT)	Teacher stimulating students' interests. Actions or statements primarily made to captivate, motivate and provoke students' zeal toward learning; projecting enthusiasm for teaching and learning.
Sociation (SOC)	Interactions or discussions which are not relevant to the immediate classroom activity, but express teacher's "humaneness"; his creation of classroom a climate of acceptance, fairness, cooperation and interaction.
Students' involvement (STU)	Teacher actions, statements or questions intended to elicit students' task-engagement/participation. Soliciting for students' reactions, responses or contribution in class discussion/task. Delegating tasks to students.
Order (ORD)	Statements that change behaviours of students or related to standard of behaviour expected; establishing rules, routines or procedures.
Proximal control (PRO)	Deliberate teacher's movement for A to B intended to monitor students' engagement/interactions or check students' ill-motivation or to merely vary teacher's stimuli.
Smoothness of lesson Transition and momentum (SMO)	Quick teacher's statements, actions, or procedures given towards time management and lesson smoothness. Utilizing individual and group responses to pace learning, proceed to new work/concept, or re-teach unclear part of the lesson.
Varying Instruction (VAR)	Teacher's use of variety of appropriate teaching strategies to accommodate students' diversity and differences in subject matter. Re-teaching, re-explaining, illustrating, elaborating, or clarification. Use of alternative models or methods.
Concurrent Dealings (CON)	Teacher's display of ability to concurrently deal with or attend to a number of classroom events without distraction or interruption of lesson. E.g. correcting deviant behavior while still maintaining smooth lesson delivery; responding to visitors call without real classroom disruption. Managing and focusing on the "whole" classroom events.
Waiting (WAI)	Teacher holding self in readiness while waiting for pupil to complete task, or listening to student's response or surveying whole class group.
Non-Verbal (NON)	Teacher's display of non-verbal languages (gestures, posture) (other than proximal movement) to signal approval or disapproval of behaviour pattern; use of non-verbal communication for maintenance, preventive or remedial, classroom behaviour management.
Others (OTH)	Teacher's behaviours not directly related to above management behaviours.

** developed from the literatures reviewed by the researcher*

APPENDIX III

CHEMISTRY ATTITUDE QUESTIONNAIRE (CAQ)

The statements in this questionnaire seek to find out how you feel about chemistry. Select freely the option that expresses your feelings toward Chemistry. There is no right or wrong answers.

Instruction: Please tick in the appropriate column to show your feelings toward the statements. SA – Strongly Agree; A = Agree; D = Disagree; SD = Strongly Disagree.

Name of student: _____

Sex: _____ Class: _____

CHEMISTRY ATTITUDE STATEMENTS

		SA	A	D	SD
1.	Chemistry is a fun				
2.	I have good feelings towards chemistry				
3.	I like chemistry				
4.	I would enjoy being a chemist or chemical scientist				
5.	Everyone should learn chemistry				
6.	I feel nervous in chemistry class				
7.	I usually look forward to my chemistry class				
8.	We do a lot fun activities in chemistry class				
9.	We learn about important things in chemistry class				
10.	We cover interesting topics in chemistry class				
11.	I love spending my free time studying chemistry				
12.	I consider our chemistry classroom attractive and comfortable				
13.	Our chemistry classroom/laboratory contains a lot of interesting equipment				
14.	My chemistry teacher encourages me to learn more chemistry				
15.	I enjoy talking to my chemistry teacher after class				
16.	My chemistry teacher makes good plans for us				
17.	Sometimes my chemistry teacher makes me feel dumb				
18.	My chemistry teacher expects me to make good grades				
19.	My best friends like chemistry				

20.	Most of my friends do well in chemistry				
21.	I always try hard, no matter how difficult the work				
22.	When I fail that makes me try that much harder				
23.	I always try to do my best in school				
24.	I try hard to do well in chemistry				
25.	Chemistry makes me feel as though I am lost in a bush				
26.	Chemistry tests make me afraid				
27.	I would probably not do well in sciences if I took it in college.				
28.	I consider myself a good chemistry student				
29.	I think I am capable of becoming an engineer, scientist, chemist or doctor				
30.	In chemistry class, I feel being in control of my learning				

APPENDIX IV

(A) TABLE OF SPECIFICATION FOR CHEMISTRY ATTITUDE QUESTIONNAIRE (CAQ)

	Scales Specification	Item No.	Nature of item
i.	Likeness for chemistry	1 2 3 4 5 11	+ + + + + -
ii.	Emotional climate of the chemistry classroom	6 7	- +
iii.	Chemistry curriculum	8 9 10	+ + +
iv.	Chemistry teacher	14 15 16 17 18	+ + + - +
v.	Physical environment of the chemistry classroom/laboratory	12 13	+ +
vi.	Friends' attitude towards chemistry	19 20	+ +
vii.	Achievement motivation	21 22 23 24	+ + + +
viii.	Anxiety	25 26 27	- - -
ix.	Chemistry self-concept	28 29 30	+ + +

(B) TEST BLUEPRINT FOR THE 30-ITEM CHEMISTRY TEST (CAT)

	Item numbers: 1-30					
	Knowledge	Application	Analysis	Synthesis	Evaluation	Total
Acids	1,2,4	3,5	0	8	6,7	8
Bases	9,12	14,15	13	11	10	7
Salts	16,17,20	18	0	18	0	5
Carbon	21,23	24,25	22	0	0	5
Carbon Compounds	26,27	28	30	0	29	5
Total	12	8	3	3	4	30