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Students' attitude and achievement in Chemistry with teacher classroom management

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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 behaviors (TCMB). A random sample of primary school chemistry students and teachers were selected from 5 junior primary Schools in Debre Markos town Amhara region. A sample size of 50 students and 5 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.

Keywords: Class Room Management, Attitude, Chemistry Achievement

1. 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 information communication technology 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 behaviors, 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. 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.

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 misbehavior, 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:

- Showing your students you are with it- wittiness (communicating to students that you are aware of everything that is happening in the classroom that you are not missing anything);
- Learning to cope with overlapping situations (keeping track of and supervising several activities at the same time);
- Striving to maintain smoothness and momentum in class activities;
- Trying to keep the whole class involved, even when you are dealing with individual pupils;
- Introducing variety, and being enthusiastic, particularly with younger pupils; and
- Being aware of the ripple effect (when criticizing student behavior, be clear, firm, focus on behavior rather than personalities and try to avoid anger outbursts).

1.1. 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‟ behaviors; 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 behavior, 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 behaviors 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 behavior of chemistry students (Padilla, Okey & Dillashow, 1983).

In the science classroom, instructional, resource and behavior 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 behaviors. He lamented the declining performance of science students despite various governmental/institutional efforts and curriculum reforms.

1.2. Objective of the Study

This study sought to ascertain the relationship between teacher management behaviors and students achievement in and attitude towards Chemistry. It considered teacher management behaviors 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 behaviors: 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.

1.3. Research Questions

The following questions guided the study:

i. How is science students achievement in chemistry correlated with teacher's classroom management behaviors?
ii. How is students attitude toward chemistry correlated with teacher's classroom management behaviors?

1.4. Hypotheses

The following hypotheses were tested in the study:

HO1: There is no significant correlation between teacher classroom management behaviors and students achievement in chemistry.

HO2: There is no significant correlation between teacher classroom management behaviors and students attitude in chemistry.

2. Method

2.1. 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.

2.2. Sample and Sampling Techniques

The study involved 5 chemistry teachers (1 per school) and 50 science students. They were drawn from 5 randomly selected public schools in Debre Markos town in Amhara region (Ethiopia) which offered chemistry at the junior primary schools level. In each selected school, an intact classroom was studied; however, only 5 students in the class were used for the study. School aptitude/achievement records ensured that the 5 selected students were representative of the class in terms of attitude and achievement in chemistry.

2.3. Instrumentation

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

The TMBOS is split into intervals (time units of 3 minutes). During the lesson period, the observer focused on the teacher for 60s at 3 minutes intervals to observe manifestation of the management behaviors. 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.

2.4. 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 junior primary schools 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. 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.

To facilitate analysis, TCMB is treated individually and as composite. That is, for each teacher, T1 – T5, individual scores for each of the 12 behavior categories are entered along with the sum of the score. 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.

3. Results

H01 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	0.411
	Sig. (2-tailed)		0.238
	N	5	5
ACHIEVT	Pearson Correlation	0.411	1
	Sig. (2-tailed)	0.238	
	N	5	5

As shown in table 1, no significant correlation was found between, total TCMB and Achievement (r = .411; p < .05). Therefore, the Ho1 is not rejected. That is, on the total, the teacher's classroom management behavior was found to have no significant correlation with achievement. Insights on the individual contributions of the 12 categories of teacher classroom management behaviors 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***
Total TCMB	Pearson Correlation	0.225	0.637(*)	0.285	0.641(*)	0.039	0.214
	Sig. (2-tailed)	0.532	0.047	0.425	0.046	0.915	0.552
	N	5	5	5	5	5	5
		SMO	VAR	CON	WAI	NON	0TH
ACHIEVT	Pearson Correlation	0.360	0.648(*)	0.194	0.212	0.075	-0.794(**)
	Sig. (2-tailed)	0.307	0.043	0.592	0.556	0.836	0.006
	N	5	5	5	5	5	5

* 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, Ho1 is not rejected.

H02 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	-0.339
	Sig. (2-tailed)		0.338
	N	5	5
Attitude	Pearson Correlation	-0.339	1
	Sig. (2-tailed)	0.338	
	N	5	5

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*
Total TCMB	Pearson Correlation	-0.680(*)	-0.378	-0.085	-0.054	-0.098	-0.608
	Sig. (2-tailed)	0.031	0.282	0.814	0.882	0.787	0.062
	N	5	5	5	5	5	5
		SMO	VAR	CON	WAI	NON	0TH
Attitude	Pearson Correlation	-0.270	-0.028	-0.049	-0.017	-0.137	0.115
	Sig. (2-tailed)	0.450	0.939	0.893	0.962	0.706	0.753
	N	5	5	5	5	5	5

* 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 Ho2 is not rejected.

4. Discussion

The findings (table 1 & 4) revealed that taken holistically, teacher management behaviors 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 behaviors. Thus, table 2 and 4 give illustration and insight into the correlation of 12 specific classroom management behaviors of teachers with chemistry achievement and attitude.

Table 2 reveals that teacher management behaviors 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 behaviors (OTH) and Students Achievement in Chemistry ($r = -0.81$; $p<0.05$). This implies that some teacher behaviors (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 Ho2 is supported by the result presented in table 3 & 4. They show an overall weak, insignificant relationship between the teacher management behaviors 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 behaviors. 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 behavior) 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 behaviors 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:

- 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 behaviors negatively affect students attitude towards chemistry.
- 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.
- Pre-service and servicing teachers should be trained in and exposed to the different categories of management behaviours to improve on their classroom practices.
- Teacher classroom effectiveness (including high student achievement and attitude) should be the goal of teacher appraisal and training programmes.
- 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.

5. 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.

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