International Journal of Modern Education Research
2014; 1(1): 11-14
Published online March 10, 2014 (http://www.aascit.org/journal/ijmer)

Keywords
Classroom Management,
Science Teaching,
Student Outcomes,
Teacher Effectiveness

Received: February 25, 2014
Revised: March 03, 2014
Accepted: March 04, 2014

Relationship between science teachers' classroom management effectiveness and students' outcomes in chemistry

ORJI, Nna Sunday

Nigerian Educational Research and Development Council, Abuja, Nigeria

Email address
nsorji@yahoo.com

Citation
ORJI, Nna Sunday. Relationship between Science Teachers' Classroom Management Effectiveness and Students' Outcomes in Chemistry. *International Journal of Modern Education Research.* Vol. 1, No. 1, 2014, pp. 11-14

Abstract
The study reported the relationship between science teachers' classroom management effectiveness and students' outcomes in chemistry. Sample consists of 60 students and 10 chemistry teachers randomly selected from 10 Secondary Schools in Ibadan. Data were collected using questionnaires. Pearson moment coefficients were used to test the null hypothesis at 0.05 alpha level significances. Science teachers' classroom management effectiveness was found to be positively related to students' learning outcomes. This finding has implications for policy formulation, teacher training and teaching-learning in science education. It was recommended that strategies be developed to acquaint both trainee and practicing science teachers on effective management in the science classroom.

1. Introduction

Classroom effectiveness has been the crux of discourse in educational quality. In the field of science education, and considering the nature of science, the learning contents and classroom environment, it is expedient that the teacher be highly proficient in conducting effective science classroom session. Classroom successes in the form of students' achievement and attitude toward science have been shown to be greatly influenced by teacher effectiveness (Orji, 2006).

According to Orji (2006), Science Education plays a vital role in repositioning nations in this age of globalization. The wealth and strength of a nation depend on advancement in science and technology. The bedrock of this advancement is a sustained investment in 'doing' and 'learning' of science in both qualitative and quantitative sense. Capie and Tobin (1981) assert that the quality and quantity of science teaching/learning produces sustainable improvement in science and technology of nations; and science teachers play a primary role in Science Teaching/Learning. The science teacher's role is both instructional and managerial. He must effectively handle contents/instructional areas and harmonize all classroom/laboratory resources and climate. Okebukola and Ogunniyi (1986) studied teacher effectiveness with focus on teacher classroom behaviours, student interactional processes and enhancing student learning outcomes.

Classroom effectiveness and competence is demanded of all science teachers. Science teaching and the teachers must encourage and inspire active science learning.

'Active learning' which is characteristic of science learning depends on the teacher's ability to organize, harmonize and maximize the science classroom transactions. How the science classroom or laboratory activities/resources are maximized is what differentiates between the Techno-scientifically advanced nations and the backward; between high performing science students and the low performers (Adesoji, Ige and Iroegbu, 2003 in Orji, 2006).

1.1. Science Classroom Management Effectiveness

Classroom success in the form of student's active involvement in assigned task and students learning outcomes have been shown to be greatly influenced by several factors broadly classified as context variables, input variables and classroom-processes. Among the input variables is teacher factor. The teacher has been regarded as the largest single influence in the classroom transactions (Simpson & Troost, 1983). Teachers are perceived as playing a primary role in students' learning process (Druva & Anderson, 1983). Students' learning outcomes are a reflection of the teacher effectiveness in managing classroom transactions.

Effective teaching requires among other things basic management skills including understanding of the nature of classrooms. Cangelosi (1993; 2000) maintained that different classroom sessions (lecture sessions, discussion sessions, etc.) required various teacher managerial competences in designing and conducting appropriate engaging learning activities. This is particularly obvious in the field of science. The characteristic/nature of science, science classroom, and teaching styles in science bear great implication to management and teacher effectiveness. Cangelosi (2000) gave a model for science classroom management (Fig. 1) that requires the science teacher to think in multi-dimensions for classroom effectiveness. He must think of managing the unique nature of the science subject (processes, procedures, products of science must be harnessed); think of handling and managing the students behaviours; of arranging and improvising materials, resources for science learning; managing learning time, laboratory design and controlling hazards.

How science teacher manages the classroom significantly affects the climate, motivation, and goal achievement in their classrooms (Tobin and Capie, 1981). Planning and implementing process skill and problem-solving activities enhance active student task engagement (Capie and Tobin, 1981; Cangelosi, 1993). Dillashow and Okey (1983) found that modified mastery learning strategy (a science instructional management) positively related to achievement, attitudes, and on-task behaviour of chemistry students.

Researches into curriculum development and implication (FMEST, 1984; Gbamanja, 2000, and Orji, 2006) recognized the vital role of learning activities in enhancing learning, especially in the sciences, and made attempts at providing a framework for building, constructing and conducting learning activities/tasks in which students are motivated and actively engaged.

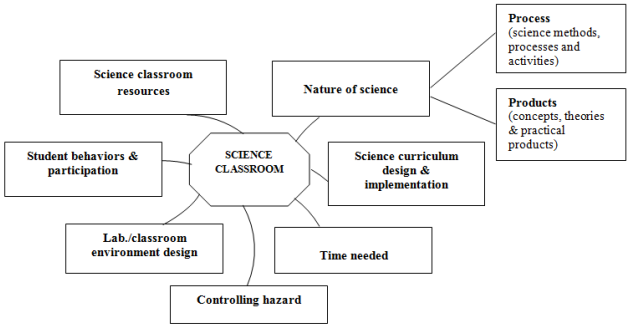

Fig 1. *Model of science classroom management.*

Orji (2006) provided a framework for designing and analyzing curriculum task. He perceived a good curriculum task (engaging task) in terms of knowledge, concepts, skills, and attitude. Designing engaging task, therefore, starts with a consideration of its relevance in contributing to the gaining of knowledge (the selection of that which is worth knowing and of interest). Every task must also have concept enrichment. It should be designed to help students to make generalizations, clarification of ideas. Skills and capacity or competence building must be sort as well as building attitudes of curiosity, honesty responsibility, initiative and open-mindedness. Morrison, Cohen and Manion (1996) maintain that effective science teaching must match students' abilities to five types of task:

- Increment tasks (involving the learning of new knowledge);
- Restructuring tasks (where students use familiar materials but are required to discover, invest or construct new ways of looking at problem for themselves);
- Enrichment tasks (where students use familiar materials in unfamiliar contexts, i.e. applying knowledge);
- Practice tasks (where familiar knowledge is rehearsed to speed up thinking processes); and
- Revision tasks (whereas students restore to their working consciousness knowledge that had been learnt some time previously).

Gbamanja (1997) lamented the declining performance of the Nigeria Science Students despite various governmental/institutional efforts. In spite of the different radical innovations and reforms in the Nigeria science curriculum, poor implementation at classroom level persists resulting in poor performance in the sciences. Okebukola and Ogunniyi (1986), Pwol (1998) traced the set-backs in Nigeria science learning to the effects of teacher behaviours and student variables like I.Q and parental background. This study therefore sought to ascertain the relationship between science teachers' classroom management

effectiveness and students' outcomes (achievement and attitude) in chemistry.

1.2. Research Hypotheses

The following null hypotheses were tested in the study:

1. There is no significant relationship between science teacher's classroom management effectiveness and students' achievement in chemistry
2. There is no significant relationship between science teacher's classroom management effectiveness and students' attitude towards chemistry

2. Method

2.1. Participants

The population of the study is the entire SS II science students in Ibadan North L.G.A of Oyo State (Nigeria). Simple sampling techniques were used to select 10 public secondary schools that offer chemistry at SS II level. 10 chemistry teachers (1 per school) and 60 students (6 per school) were selected for the study by simple random sampling. [This study is part of a larger study (Orji, 2006) that utilized various instruments including extensive classroom observation of teacher and student behaviours. Only 10 teachers were used.]

2.2. Research Design

The research used correlation design. It investigated relationship between teacher classroom management effectiveness and student learning outcomes.

2.3. Instruments

Three instruments were used in the study. These are: Teacher Classroom Management Effectiveness (STCME) Questionnaire, Chemistry Achievement Test (CAT), and Chemistry Attitude Scale (CAS).

The STCME Questionnaire: This was adapted from a larger scale developed by Orji (2006) to measure classroom management styles and behaviours of teachers. The STCME questionnaire comprised of 24 items that measured teacher competence/effectiveness in classroom management on 5-point scales.

The questionnaire was validated by experts in science education. For content validity, the questionnaire was designed to cover three sub-scales: efficiency in student behaviour management (items 1, 2, 4, 6, 9, 12, 14, 22), efficiency in instructional management (items 7, 10, 11, 17, 18, 20, 23, 24), and efficiency in classroom management (items 3, 5, 8, 13, 15, 16, 19, 21). The reliability was calculated using test-retest reliability coefficient. 15 teachers responded to the questionnaire. After a week, the same questionnaire with items rearranged was administered to the same teachers. The results of the two sets of responses were compared using Pearson moment correlation. The value of the calculated r = 0.67.

The CAT: The student Chemistry Achievement Test (CAT) contained 30-item objective (4-option) tests developed by the researcher from four topics in SSII Chemistry: Acids, Basis, Salts and Carbon/Carbon Compounds. Face validation of the test was conducted by science education experts, while a test blueprint ensured content validity in line with Orji (2006).

The test-retest reliability coefficient was found to be r = 0.72. This was calculated using 25 students who were not part of the student samples. They took at intervals of two weeks two versions of the same test with test items rearranged.

The CAS: This comprised a 30-item scale with 5-point loading ranging from strongly Agreed (SD) to strongly Disagreed (SD). It is an adapted form of an earlier scale developed and validated by Okey and Capie (1980).

Orji (2006) reported the validation and reliability of the adapted version of the scale. A table of specification ensured content validity for the chemistry attitude scales (CAS). It contained items 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 re-concept. The CAS gave a Crombach alpha reliability of 0.68.

2.4. Procedure for Data Collection and Analysis

The STCME questionnaire was administered to teachers drawn from the sample schools (10). The teachers had taught intact classes the topics: Acids, Basis, Salts and Carbon/Carbon Compounds. The topics form coverage for the 30-item CAT questions administered to 6 students from each teacher's class. The student also completed the CAS. Average CAT and CAS scores for each school (N=10) were obtained using simple statistics. Teachers' scores from the STCME questionnaires were correlated with school averages for CAS and CAS using Pearson correlation coefficients

3. Results and Discussion

Research Hypothesis –Ho (i) states: "there is no significant relationship between science teacher's classroom management effectiveness and students' achievement in chemistry. The result is presented in table 1 which shows correlation between the two variables.

In table 1, science classroom management effectiveness is shown to have a strong, positive and significant correlation with Achievement in chemistry ($r = 0.65$; $p<0.05$). Increase in science teacher's classroom management effectiveness leads to increase in student achievement in Chemistry. The null hypothesis ***–i,*** therefore, *is* rejected.

Research Hypothesis –Ho (ii) states: "there is no significant correlation between science teacher's classroom

management effectiveness and students' attitude towards chemistry". Table 2 shows the correlation analysis testing the hypothesis.

Table 1. *Correlation analysis for 2 'VAR' Variables: STCME & ACHIVT (Pearson correlation coefficients / Prob > |R| under Ho: Rho=0, N = 60).*

	STCME	ACHIVT
STCME	1.00000 0.0	0.64708 0.0462
ACHIVT	0.64708 0.0462	1.00000 0.0

Table 2 reveals a very weak, positive, insignificant relationship between science teacher's classroom management effectiveness and chemistry attitude (r = 0.10; P>0.05). This implies that there may be variables other than classroom management effectiveness that account for good attitude to chemistry. The null hypothesis –***ii,*** therefore *is not* rejected.

Table 2. *Correlation analysis for 2 'VAR' Variables: STCME & ATTITUDE (Pearson correlation coefficients / Prob > |R| under Ho: Rho=0, N = 60).*

	STCME	ATTITUDE
STCME	1.00000 0.0	0.10077 0.4436
ATTITUDE	0.10077 0.4436	1.00000 0.0

Table 3. *Simple Statistics for the 3 Variables: STCME, ACHIVT & ATTITUDE.*

Variable	N	Mean	Std.Dev.	Sum	Min.	Max.	Max.Exp. ½ Mx	
STCME	10	36.0000	11.4698	360.0	18.0000	53.0000	96	48
ACHIVT	10	12.1200	2.9491	121.2	5.3000	15.3000	30	15
ATTITUDE	10	90.9250	3.4378	909.3	83.3000	96.2500	120	60

The major findings of this study follow:

1) A strong, positive, significant relationship exists between science teachers' classroom management effectiveness and achievement in Chemistry
2) A very weak, positive, insignificant relationship exists between science teachers' classroom management effectiveness and attitude in Chemistry.

4. Conclusion/Recommendations

Qualitative and quantitative teaching and learning of science is the bedrock for advancement in this age of globalization. In this light, attention must be given to what happens in the science classroom/laboratory, especially harnessing and managing science resources and processes at classroom level. The science teachers' training and retraining in the pre-requisite skills of science classroom management will ensure improvement in achievement in and attitude towards chemistry.

The study therefore recommends the following:

1. Science teachers should be trained in management of various science classroom sessions to improve on their classroom practices.
2. Teacher Classroom Effectiveness should be the goal of teacher training and teacher appraisals; student's task engagement levels, achievement and attitudes should be indicators for science teacher effectiveness/appraisals scale.

References

[1] Capie, W. & Tobin, K. (1981). Pupil engagement in learning tasks: A fertile area for research in science teaching. *Journal of Research in Science Teaching*, l8, 409-417.

[2] Cangelosi, J. S. (1993). *Classroom management strategies: Gaining and maintaining students' cooperation*. London: Longman.

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

[4] Druva, C. A. & Anderson, R. D. (1983). Science teacher characteristics by teacher behaviour and by student outcome: A meta-analysis of research. *Journal of Research in Science Teaching,* 20 (5), 467 - 479.

[5] Federal Ministry of Education, Science and Technology. (1984). *Chemistry curriculum for senior secondary school.* Lagos: Author.

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

[7] Marrison K., Cohen L., & Mannion, L. (1996*). A Guide to teaching practice (4th ed.).* London and New York: Routledge, Taylor & Francis Group.

[8] Okebukola, P. A. & Ogunniyi, M. B. (1986). Effects of teacher's verbal exposition on students level of class participation, and achievement in biology. *Science Education,* 70 (1), 45-51.

[9] Orji, N. S. (2006). *Relationship among teacher classroom management behaviours, students' task engagement, and students' outcomes in chemistry* (Unpublished Master's Thesis). University of Ibadan, Ibadan.

[10] Pwol, C. S. (1998). *Relationship between teacher management behaviour and student academic achievement in SS2 biology in Plateau State* (Unpublished doctorial dissertation). University of Jos, Jos.

[11] Simpson, R. O. & Troost K. M. (1982). Influences on commitment to and learning of science among adolescent students. *Science Education,* 66 (5), 763 - 781.