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Affective Science Teaching: A Method to Enhance Qualitative Science Education in Nigeria

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Abstract: The purpose of the study was to enhance the qualitative teaching of science through affective method. Affective teaching was compared with cognitive teaching of integrated science in the Junior Secondary School. Twenty schools were randomly selected in Ado-Ekiti Nigeria. A sample of 400 Junior Secondary school students, 200 males and 200 females participated in the study 20 items questionnaire tagged Cognitive and Affective Domains Aptitude Test (CADAT) adapted from a standardized test was used to test both the cognitive and affective methods on the learning capacities of the respondents in integrated science t-test was used to analyze the scores. Three Null hypotheses were postulated and tested. Results showed that, there was a significant difference between cognitive and affective achievements of students in science. Hypotheses I was therefore rejected. Hypotheses 2 and 3 indicated no significance gender difference between cognitive and affective test scores. It was concluded that employing affective method in the teaching of integrated science in Nigerian secondary school would enhance the understanding of science more than what is operating now in science classroom. This method could further be experimented at the senior secondary school level.

Key words: Affective methods, cognitive, qualitative, enhancing, aptitude, gender and integrated science

INTRODUCTION

The present global scientific and technological civilization calls for an imperative effort to equip every Nigerian youngsters with appropriate scientific potentials with which they would be able to interact intelligently where ever they are. Serious aberration on the quality of science teaching in Nigeria frequently cited in literature is over-emphasis on mastery of subject matter content, theory and excessive examination consciousness against practical orientations towards science based disciplines. Several Nigerian science educators such as Okebukola (1985), Banu (1994), Agusiobo (1997), Odunusi (1997) and Azeke (1997) among others have openly and widely indicted the quality of science instructions in Nigeria secondary schools. A number of allegations frequently leveled against the quality of science instruction include:

- Excessive examination consciousness.
- Over-emphasis on mastery of content matter as against acquisition of practical science process skills.
- Total lack or insufficient participation of students in the learning process.
- Preponderance of teacher authoritarianism and theory based didactic science classes.
- Inability of students to perform important science process skills practically.

With the above listed factors, science is treated merely as an academic discipline meant for cognate studies alone. Science is thus made alien rather than being a tool for industry. World-over, there is an increasing emphasis on technology in the workforce in this age of digital information. The American Association of University Women (AAUW, 2000) report noted strongly that in the new computer age, all future jobs including those of arts medicine, law, design, literature and the helping professions will involve technology. If acquiring scientific skills is inseparable from technological growth, the crafts of the trade must be provided. Acquiring scientific skills should therefore, be made less alien, less threatening and more accessible to the learner. Based on this premise, affective science teaching is advocated.

Affective teaching as presented by Cochram-Smith (2003) in the learner centred model of teaching is a process that should actively engage the learner in the subject matter that must be relevant to the personal interest, experiences and needs of the learner. Conventionally, affective teaching is learner-oriented. The student learner is only guided by the teacher who is

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a facilitator. What is expected of the teacher is to guide the student learner to appreciate the worth of the learning material. In affective teaching/learning process, the learner is more actively involved both personally and emotionally. The students' value systems are greatly exploited such that the learning experience is made interesting and relevant to the learner's immediate environment. Advocates of effective science teaching in literature often strongly stress the use of pragmatic methods such as inquiry/discovery teaching methods for science instruction. Young (1989) christened science as "a doing subject" hence emphasised the use of practical approach to teach science effectively especially to the primary school pupils. Research reports such as Beane (1990) and Lang *et al.* (1998) suggested that inquiry and discovery teaching methods can focus on the affective aspect of human functioning as well as it does to the cognitive level of the learner's functioning. In the study conducted by Shechtman and Leichtentritt (2004) in Israel, they found and posited strongly that the third level teaching model (which concerns the affective domain) is a teaching device used to increase students' personal and emotional involvement in the learning process. They also found out that during the affective periods in the learning process, there will be fewer disciplinary problems and students usually more self explorative and supportive to each other.

The quality of science education needed in Nigeria to keep abreast of the present global scientific civilization is the type that is connected to the real world of the learner. The model of teaching that would make them self-explorative, gain insight into the problem situation, acquire problem solving skills and have a form of self-understanding of the environment. As clearly documented in the national policy on education the Nigerian nation recognizes the utility value of science a nd technology. Everyone now knows that absence of science culture is disastrous to any society. Part of the concerted efforts needed to produce scientifically literate citizens in Nigeria however, is this research set to investigate how Nigerian youngsters fare through affective science teaching.

Statement of the problem: In view of the existing gap between the intended and the observed antecedents of science instruction in many Nigerian schools, this study is designed to isolate student's cognitive and affective scientific aptitudes acquired at the Junior Secondary School (JSS). And to assess the level of performance of students in Integrated Science. Using Standardized Aptitude test.

Research hypotheses: Three null hypotheses were postulated and tested.

Ho_1 : There is no significant difference between students' cognitive and affective scientific aptitudes acquired at JSS level.

Ho_2 : There is no significant difference between cognitive scientific aptitude of male and female at JSS level.

Ho_3 : There is no significant difference between affective scientific aptitude of male and female at JSS level.

MATERIALS AND METHODS

This is a quantitative survey research aimed at investigating the performances of student in cognitive and affective scientific aptitude test at the junior secondary school. A sample of 400 JSSIII students, 200 males and females were randomly selected from 20 secondary schools in Ado-Ekiti, Nigeria. The choice of Ado-Ekiti was because of urban influence being Ekiti-State capital city and the availability of instructional materials for teaching integrated science in the sampled schools. Twenty students were selected from each of the 20 sampled schools.

Instrument: Questionnaire tagged Cognitive and Affective Domain Aptitude Test (CADAT) adapted from a standardized test; "An examination of science processes" by National Science Teachers Association, Maryland U.S.A was revalidated and used for the study. A total of 20 test items, 10 items testing the cognitive aptitude while the other 10 for the affective aptitude in Integrated Science education acquired at JSS. The researchers went to the sampled schools to personally administer the questionnaire. The responses were collected on the spot hence the entire questionnaires were returned for data analysis.

Data analysis: The data collected was subjected to computer analysis using SPSS 12 statistical package. Two variables isolated for analysis were cognitive scientific aptitude test scores and affective scientific aptitude tests scores of respondents. The two sets of data were checked for the condition of normal distribution of the data by plotting the histogram with the normal curve (Fig. 1). It was found that the variables were skewed (ref to the graphs indicated below). The same skew ness was noticed after transforming the data to log 10.

Diagram on cognitive test: Histogram of data with the normal curve.

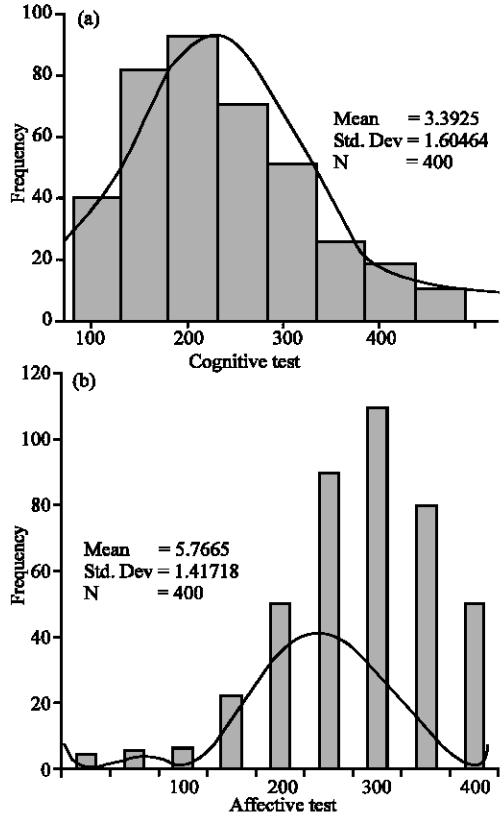

Fig. 1: Histogram of data with normal curve a) cognitive text, b) affective test

RESULTS

The differences between the two sets of data were measured by t-test paired sample and independent sample.

Hypothesis one (Ho_1)

Results of the analysis in Table 1 and 2 indicate a significant difference between cognitive and affective achievement of students in integrated science subject. The mean score for affective aptitude test score (5.7665) is greater than that of cognitive aptitude test score (3.3925). This shows that the respondents generally perform better at tasks indicating affective orientations than that of cognitive aptitude. The null hypothesis one (Hoi) was rejected. Therefore, "there exists a significant difference between cognitive and affective achievements of students in science at JSS".

The results shown on Table 3-5 indicates no significant difference between male and female in both cognitive and affective test scores. The indication of no statistically difference reveals that the students' aptitude in cognitive and affective concerns is not a function of sex or gender. The calculated t-value (0.592) is consistent with the probability level (0.554) for cognitive aptitude between male and female. While the t-value (0.585) and probability of (0.559) for affective aptitude implies same result of no significant difference between male and female in affective orientations.

Table 1: T-test paired samples statistics

		Mean	N	Std. deviation	Std. error
Pair 1	Cognitive test	3.3925	400	1.60464	0.08023
	Affective yest	5.7665	400	1.41718	0.07086

Table 2: Paired samples test

		Paired differences			95% Confidence interval of the difference		t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	Lower	Upper			
Pair 1	Cognitive test -Affective test	-2.37400	1.71840	0.08592	-2.54291	-2.20509		399	

Table 3: Gender difference t-test for group statistics

Gender		N	Mean	Std. deviation	Std. error mean
Cognitive test	Male	200	3.4400	1.57122	0.11110
	Female	200	3.3450	1.63995	0.11596
Affective test	Male	200	5.8080	1.36869	0.09678
	Female	200	5.7250	1.46633	0.10369

Table 4: Independent samples test

	Levene's test for equality of variances		t-test for equality of means					95% confidence interval of the difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error diff.	Lower	Upper
Cognitive test equal variances assumed	0.064	0.801	0.592	398.000	0.554	0.09500	0.16060	-0.22072	0.41072
Equal variances not assumed			0.592	397.273	0.554	0.09500	0.16060	-0.22072	0.41072
Affective test equal variances assumed	0.834	0.362	0.585	396.125	0.559	0.08300	0.14183	-0.19584	0.36184
Equal variances not assumed			0.585	398.000	0.559	0.08300	0.14183	-0.19584	0.36184

Table 5: Gender difference: Ranks

	Gender	N	Mean rank	Sum of ranks
Cognitive test	Male	200	205.06	41011.00
	Female	200	195.95	39189.00
	Total	400		
Affective test	Male	200	203.28	40656.00
	Female	200	197.72	39544.00
	Total	400		

The major results of this study are:

- There is a significant difference between cognitive and affective achievement of students in science at the junior secondary school in Nigeria.
- There is no significant difference between male and female in cognitive achievement.
- There is no significant difference between male and female in affective achievement.

DISCUSSION

Effective learning of science tended favourably towards active learning in contrast to passive types. White (1989) while reviewing science learning stated that it involves much processing of images, learning many propositions as well as selection of events for attention. He further stressed the vital characteristics of science learning as dependent on the attribute of the observer (i.e. the student learner) and the construction of meaning from the stimuli received. This notion gives credence to affective teaching model presented by Cochram-Smith (2003) which is to actively engage the leaner in the subject matter that must be relevant to the personal interests, experiences and needs of the learner. Using such model for teaching science, the learner would take the responsibility of his learning by being actively involved both personally and emotionally. To that end, the students' value system would be exploited greatly. Cochram Smith's notion is supported by Schehtman and Leichtentritt (2004) who made an assertion that teaching models which concerns affective domain is a teaching device to increase students' personal and emotional involvement in the learning process. They emphasized further that students would be more explorative and support one another in meaningful learning process. As the status of science instruction continues to be a concern of science educators in Nigeria, the findings of this study implies the need to actualize the use of pragmatic methods of science teaching. Inquiry/discovery affective methods will facilitate science learning in more practical terms and produce more effective science learners.

Gender did not seem to be significant index in this study. The findings indicate no statistically significant gender difference in patterns of students' achievement in both cognitive and affective orientations. This is consistent with research reviews reported by Dauda (1991), that conclusive empirical evidence as regards superiority of male over female is still lacking. The AAUW (1998) advocated that females need to be better prepared technologically so as to be able to compete with their male counterparts in the new knowledge-based economy.

Another concern raised for discussion is the effect of affective teaching models on academic achievement. Some of the issues raised in literature in this regard were that inquiry/discovery method of science teaching can proof counter productive if not properly managed. The fact that the direction of the lesson cannot be pre-determined by the teacher who also is only a facilitator or guide and not the sole manager of the learning process, Shechtman and Leichterntritt (2004) reported a study conducted among students with learning disabilities in Israel that affective teaching could positively affect academic achievement. The problem of the abysmal decline in pupils' performance in science as reported by Odunusi (1997) can be nibbled at the bud with affective science teaching. As affective teaching trains students to take more responsibility for their own learning, learners are made to acquire more permanent commitment to learning. This will change students' orientation of restricting their views of learning to acquisition of knowledge to pass tests or examinations only. Affective science teaching would help students to adopt a broader perception of the contextual situation of their learning. That would produce a more dynamic and valuable learning styles and self-understanding. Another merit of affective science teaching is that students would be able to transfer the acquired self-control of situations to other lessons, other subject areas and other areas of performance.

CONCLUSION

The investigation revealed that using affective teaching models in science instruction in Nigerian classrooms would yield better results than what obtains presently. Nigeria science educators (teachers) should therefore:

- Employ affective science teaching models, which would enhance more permanent commitment to science learning by students.
- Engage students with more pragmatic activity based practical approaches to science instructions without altering the concepts.

- Treat both male and female students as equal sources of intellect by engaging them in same tasks of science based practical activities in and out of the classroom.
- Accept and use large volumes of recommendations made available in literature on affective orientations.

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