ISOLATION OF FACTORS IN TEACHERS' PERCEPTION OF SENIOR SECONDARY CHEMISTRY PRACTICAL IN NIGERIA

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The paper highlights the origin of chemistry curriculum in Nigeria together with its associated objectives. The sorry state of chemistry practical in the nation's secondary schools was made known by the author. However, the perception of 145 chemistry teachers of the practical aspect of the curriculum was analyzed using factor analysis. Eight principal component factors were extracted from the correlation matrices and rotated by the varimax criterion of the teachers' responses. They were: Strategies for teaching chemistry, Time allotted for teaching chemistry, Overloaded content, Lack of acquisition of necessary skills, Lack of standard laboratory, Facilities and equipment, Learning difficulties and students' understanding and Teachers' competency and teaching experience. The resultant eight factors accounted for 80.32% of the total variances on the teachers' perception profile and they are the major factors perceived by the chemistry teachers to hinder effective learning of skills in the senior secondary school chemistry practical. The paper concludes by giving appropriate recommendations, which would go a long way in enhancing the teaching of chemistry practical in Nigerian schools.

INTRODUCTION

The teaching of chemistry with practical activities tends to reinforce what is learnt during the theoretical class and it is expected to encourage among students, the spirit of experimentation, keen observation and such personality qualities as self-confidence, critical attitudes and perseverance.

The senior secondary chemistry curriculum in Nigeria is a multi-agency approach to curriculum development. It was jointly developed by the Federal Ministry of Education, the then Comparative Education Study and Adaptation Centre (CESAC), National Education Research Council (NERC), West African Examination Council (WAEC), Science Teachers' Association of Nigeria (STAN), The Nigerian Universities and State Ministries of Education.

Objectives of teaching chemistry practical are:

- to enable students to appreciate the scientific method which involves experimentation, accurate observation, recording, deduction and interpretation of scientific data
- to enable students develop laboratory skills, including awareness of hazards in the laboratory and the safety measures required to prevent them.

Attainment of these objectives will depend on the teacher, the students, the materials and the learning environment (Ogunyemi, 1999).

According to Awodi (1984), students must master a range of manipulative skills and instrumental techniques. Balogun (1992) was of the opinion that students should not be taught in a way that requires listening, recording and regurgitation of facts. However, Adeyegbe (1994) observed that, teaching practical skills has often been a neglected aspect of science teaching by teachers in Nigeria. This neglect, according to Ikoku (1982), makes chemistry difficult for learners and consequently, they perceive chemistry as a difficult and abstract subject.

However, successful implementation of the practical aspect of the senior secondary curriculum in Nigeria depends on the following: emphasis on practical activities (Oladapo, 1997), teachers' competency in the following areas: subject matter, pedagogy, skill processes, behaviour motivation and evaluation (Iwowi, 1999), ability of students to recall required knowledge (Frazer, 1982), small class size (Glass, 1985) and acceptable teacher's strategies (Okebukola, 1990, Duyilemi, 1998).

The nature of the chemistry curriculum has been widely criticized by researchers in science education including the teachers of the subject. Adesoji (2002) observed that senior secondary school chemistry curriculum objectives are over-ambitious; the contents are overloaded and are difficult to achieve in reality. Iroegbu (1999) found out that the curriculum contains too much material, which previously belonged to the advanced level chemistry programme. How then do the teachers of this subject perceive the practical aspect of the curriculum?

The aim of the paper

The paper is aimed at isolating the factors in the perception of the senior secondary practical aspect of the chemistry curriculum by the teachers. This would enable us make appropriate recommendation as to the effective implementation of the curriculum.

Research Questions

1. What are the factors perceived by the chemistry teachers to hinder effective learning of skills in senior secondary school chemistry practical?
2. What are the underlying relationships among the loaded variables with factors as perceived by the senior secondary school chemistry teachers?

METHOD

Research Design

An ex-post facto survey design was adopted for the study. It involves the collection of data on teachers' perception of chemistry practicals using appropriate questionnaires. This design was suitable because there was no manipulation of the independent variables.

Sample and Sampling Techniques

The study sample consisted of all the 145 chemistry teachers in the entire senior secondary schools in the local government areas that made up Ibadan metropolis, the capital of Oyo State, Nigeria.

Instrumentation

A Likert type teacher questionnaire was used for data collection. The respondents are to indicate their agreement or disagreement on a 4-point scale of Strongly Agree, Agree, Disagree and Strongly Disagree. The reliability coefficient of the instrument was found to be 0.75.

Data Analysis

Data collected were subjected to factor analysis. The type of factor analysis used was the extraction of the initial factors, utilizing principal components factor extraction and orthogonal rotation by the varimax criterion.

RESULTS AND DISCUSSION

Research Question 1

What are the factors perceived by the chemistry teachers to hinder effective learning of the skills in senior secondary school chemistry practical? In order to answer the question, reference is made to table 1.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3670	17.478	17.478	3.670	17.478	17.478
2	2821	13.433	30.911	2.821	13.433	30.911
3	2539	12.091	43.002	2.539	12.091	43.002
4	2307	10.985	53.987	2.307	10.905	53.987
5	1954	9.304	63.290	1.954	9.304	63.290
6	1.356	6.457	69.747	1.356	6.457	69.747
7	1.215	5.785	75.532	1.215	5.785	75.532
8	1.005	4.784	80.317	1.005	4.784	80.317
9	900	4.286	84.603			
10	656	3.126	87.729			
11	600	2.858	90.586			
12	417	1.987	92.574			
13	403	1.919	94.493			
14	326	1.555	96.048			
15	283	1.347	97.395			
16	212	1.011	98.405			
17	122	583	98.989			
18	8.947E-02	426	99.415			
19	6.513E-02	310	99.725			
20	3.034E-02	144	99.869			
21	2.743E-02	131	100.00			

Table 1: Factor Analysis of Teachers' Perception of Senior Secondary School Chemistry Practicals

The table indicated that 8 factors are meaningful in the teacher questionnaire. The factors are, strategies for teaching chemistry, time allotted for teaching chemistry, overloaded content of the chemistry curriculum, lack of acquisition of necessary skills through practical work, lack of standard laboratory, lack of laboratory facilities and equipment for teaching chemistry, learning difficulties and students' understanding of chemistry, teacher's competency and teacher's experience. These are the major factors perceived by the chemistry teachers to hinder effective learning of skills in the senior secondary chemistry practical. This result is in line with Okebukola (1982) who also used factor analytic approach to reduce 52 items to 34.

Question 2

What are the underlying relationships among the loaded variables with factors as perceived by the senior secondary school chemistry teachers?

Rotated Component Matrix [a]

	Component							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
TQ1				.481		-.593	-.424	
TQ10				.573	.719			
TQ11			-.413	-.422	.659			
TQ12			-.621			.609		
TQ13		.744				.264		
TQ14		.414	.473			-.277	.560	
TQ15						.776		
TQ16		.454			.325	-.572	.366	
TQ17		-.814						
TQ18								.832
TQ19	-.375	-.705						.357
TQ2				.896				
TQ20	.629	.431						-.294
TQ21			-.814			-.263		
TQ3				-.641		-.331		-.404
TQ4								
TQ5	.837						.873	.333
TQ6								
TQ7	-.713		.299		.885			.281
TQ8	-.266		.651					
TQ9	.687						.324	

Table 2: Rotated Component Matrices for Chemistry Teachers

Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization a Rotation converged in 16 iterations

The resultant 8 factors in teacher questionnaire accounted for 80.32% of the total variances on the teacher's perception profile. Analysis of the high-loading variables on each of the 8 factors is in Table 2. It indicated the factors interpretable and the underlying relationships that exist among the loaded items on factors. Those variables having a factor loading of 0.25 or greater were judged to be interpretable. This indicates that any factor with a correlation matrix less than 0.25 with a variable is not significant to that variable. This is in agreement with Bradin (2002) who had all his items with factor loading greater than 0.25 for analysis.

Table 2 represents the terminal solution of orthogonal rotated factors. Since it is an orthogonal factor matrix, it represents both pattern and structure matrices. That is, the coefficients in the Table represent both regression weights and correlation coefficients. It is shown from the table that most important determinants of teacher question 1 are factors 4, 6 and 7. Six teacher questions indicate factorial complexity of 1. Six questions loaded moderately on two factors, 6 questions indicate factorial complexity of 3 and 2 questions indicate factorial complexity of 4. Question 21 has factorial relationship with factors 3 and 6. Also, question 3 has inverse relationship with factors 4, 6 and 8. That is, it has indirect meaning with those factors.

Analysis of questions on each of the 8 factors on teacher questionnaire resulted in factor names being assigned which best conceptualized each factor's high loading items.

CONCLUSION AND RECOMMENDATION

The study revealed that teachers perceived eight factors as major factors hindering effective learning of skills in senior secondary chemistry practical.

The teachers perceived that the content of the chemistry curriculum is over-loaded and there is a lack of laboratory facilities and equipment for teaching chemistry practical; this hinders teachers from using inquiry method for teaching chemistry. They perceived time allotted for teaching chemistry as inadequate and it makes them to rush over many topics without practical activities with the view to finish the syllabus. This has adverse effect on students' understanding of chemistry as it enables students to perceive chemistry as difficult and as an abstract subject. Also, teachers perceived lack of chemistry laboratory as a major factor hindering acquisition of necessary skills through practical work. Teacher's competency and teaching experience also hinder effective learning of skills in senior secondary chemistry practicals.

With these findings, teachers should incorporate practical activities into their lessons to facilitate better and proper understanding of chemical concepts. They should also adopt inquiry method of teaching in order to stimulate students' interest in the subject. Authorities of each school should make enough money available for procurement of equipment and chemicals for practicals. Adequate time should also be allotted for chemistry practical. The curriculum designer should prune down the overloaded contents of the chemistry curriculum so that teachers will not abandon practical aspect with the view to finish the syllabus.

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