

TEACHERS' SELF-CONCEPT AND CHEMISTRY STUDENTS' ACQUISITION OF SCIENCE PROCESS SKILLS IN SENIOR SECONDARY SCHOOLS IN IKOM EDUCATION ZONE OF CROSS RIVER STATE, NIGERIA.

Asikong, William Etta¹, Obi, Joy Joseph Ph.D², Agim, Francis Betianabeshie³

Department of Physical Science Education,
Faculty of Science Education,
College of Education, University of Calabar, Calabar.

williamasikong080@gmail.com
08162845874, 08075542024

joyobi@unical.edu.ng
08059945792

frankagim@gmail.com
07062727411

Abstract

This study investigated the influence of teachers' self-concept and chemistry students' acquisition of science process skills in Ikom Education Zone of Cross River State, Nigeria. To achieve the purpose of this study, one null hypothesis was postulated to direct the study. An ex-post facto research design was adopted for the study. The targeted population consisted of all Chemistry students in Ikom Education Zone. A sample of three hundred (300) respondents was randomly selected through a stratified random sampling technique. Two instruments were formulated entitle "Teachers' Self-concept Questionnaire (TSQ) and Science Process Skills Acquisition in Chemistry (SPSKC), and was validated by experts from the faculties of Science Education and Educational Foundations, University of Calabar. Cronbach's Alpha Reliability Coefficient was used to test the internal consistency of (TSQ) =0.76 and 0.87. Ruder Richardson formula 20(kr-20) was used to test the process skills at the estimate of 0.72. One-way Analysis of Variance (ANOVA) was used for data analysis at 0.05 level of significance with relative degrees of freedom. The result of the findings indicate that teachers' self-concept, significantly influenced chemistry students' acquisition of science process skills in Ikom Education Zone of Cross River State. It was recommended that stakeholders in the educational sector should organize workshops for the training and re-training of teachers to enhanced the understanding of self-concept in their teaching profession that would stimulate the acquisition of science process skills among students.

Keywords: Teachers' Self-Concept, Chemistry Students, Acquisition, Science Process Skills, Knowledge

Introduction

Today's world is face with rapid scientific and technological changes. To switch to this new development requires teacher's ability to inculcate the right values, beliefs and skills to the students through teaching, learning and the understanding of science process skills. This will enable the students cope with future challenges involved in science enterprises. According to Kalu, (2018), says science is keyed in the development of literate teachers that teaches the students in turn. In recognitions to this roles of science education to nation building, the national policy on education FRN, (2017) identifies science as the hallmark for scientific and technological advancement of the country, Nigeria. It therefore, stipulate that skills (process skills) that will advance the understanding of science subjects should be taught at all level of education.

In teaching science subject, chemistry in particular science teachers should exhibit characters (self-concept) that emphasize and enhanced students' reflective thinking, creative reasoning as well as knowledge of process skills acquisitions (Egbe, 2016). This science process skills is what scientist used in carrying-out scientific activities. Ihejiamazu et al., (2020) define scientific process skills as ways in which scientists gather, sort, organize, analyze, and make sense of information about the world. The process skills are divided into two main groups, which include basic and the advance process skills. The basic skills are observing, communicating, classifying, measuring, predicting, and inferring. While the advance process skills are hypothesis, controlling variables, experimentation, data analyzing, interpretation and control of the environment (AAAS, 2017; Pujari, 2015). Basically the researcher is concerned with the basic science process skills. Science as what scientist does to earn a living. In Auwal, (2018) perceived science as fundamental component to the development of nations. For instance, Japan, before now was classified with Nigeria as a developing nation is currently well developed and has becomes an advance nation due to her state of scientific and technological advancement through the knowledge of science process skills (Kalu, 2018).

Teachers' self-concept, has to do with the way teachers sees or evaluate his or himself. Individual's perceptions differs due to the fact that the way Mr. A sees himself is different from the way Mr. B sees himself. Self-concept is a broad view of who we are physically, mentally, socially and spiritually (Isangideghi, 2011). It can be developed over time. It is how we learn to form and relate ourselves self-concept based on the knowledge we gain about ourselves, other's input and feedback. When people meet other people for the first time they usually introduce themselves by providing information about themselves (Chin and Osborne, 2018). How we view ourselves and the statement we make about ourselves formed our self-concept (Richman et al. 2021). Teacher's high and lower self-esteem would help to boost or mar student's participation in learning, particularly in the acquisition of science process skills. The process skills, such as observing, measuring, inferring, predicting, classifying, recording and interpreting are what scientist used for their scientific investigations which is essential in the overall understanding of scientific concepts and problem-solving abilities (Padilla, 1990; Oladejo, 2019). In chemistry specifically, science process skills enable students to bridge theory with practice, conduct laboratory investigations and build scientific reasoning (Njoku, 2015; Uguwayi, 2019).

Teachers' abilities (self-concept) can influence the quality of their action towards students. Teachers' self-concept is a function of how the teachers evaluate his or herself in terms of what he or she can be able to achieve. A teacher can develop either high or low self-concept of him or herself. A teacher with low self-concept will make a rote learner with low level performance and become underachiever. While teachers with high self-concept make a meaningful learners and achievers (Ghanizadeh et al., 2014). It is often how individuals feel, think, evaluate or perceive themselves. In other words, it is one's mental picture about self. Teachers' self-concept differs depending on their personality, cognitive ability and their emotional potentials (Asikong, 2023). According to Isangideghi, (2011) self-concept is a cognitive aspect of self that generally deals with the totality of opinions that each person holds to be true about his or her personal existence. He further classified self-concept into two components via; Positive or high self-concept; this refers to an individual's view of himself as being capable, adequate, worthy etc. Negative or low self-concept; this he refers to as the opposite of positive self-concept. That is, individual's view of him as unworthy, incapable and inadequate. Teachers' self-concept play a central role in shaping students' academic achievement and skills. This point was buttress in a research conducted by Ihejihamazu et al., (2020) on teachers' self-concept and biology students' acquisition of science process skills in Calabar Metropolis, Cross River State. And in another research study carried out by Asikong, (2023) on the influence of teachers' variable (self-concept) and chemistry students' acquisition of science process skills in Ogoja Education Zone, Cross River State, Nigeria. Both studies came to a conclusion that teachers' self-concept, significantly influence students' knowledge of science process skills, and their instructional delivery and classroom interactions. Teachers with positive self-concept are more likely to engage students in inquiry- oriented activities, utilize learner-centered pedagogies, to foster the acquisition of science process skills (Akinbobola & Afolabi, 2019).

In Nigeria, despite policy emphasis on practical-oriented teaching, evidence suggests that many students graduate from secondary school with poor mastery of science process skills. This situation has been attributed partly to limited laboratory resources but also to teachers' professional dispositions, including their self-concept (Ogunleye & Babajide, 2021). In the Ikom Education Zone, anecdotal classroom reports indicate that chemistry students continue to struggle with practical skills, raising questions about whether teachers' self-concept influences this outcome. Yet, empirical studies directly linking teachers' self-concept to students' science process skills in this context are scarce. This gap makes it necessary for the researcher to investigate the influence of teachers' self-concept and chemistry students' acquisition of science process skills in Ikom Education Zone of Cross River State, Nigeria.

Purpose of the study

The main purpose of this study is to investigate teachers' self-concept on chemistry students' acquisition of science process skills in Ikom Education Zone of Cross River State, Nigeria. Specifically, the study seeks to.

1. Examine the influence of teachers' self-concept on Chemistry students' acquisition of science process skills in Ikom Education Zone.

Research questions

1. What is the influence of Teachers' Self- Concept on Chemistry Students' acquisition of Science Process Skill in Ikom Education Zone?

Statement of hypotheses

1. Teachers' self-concepts does not significantly influence acquisition of science process skill amongst Chemistry students' in Ikom Education Zone

Methodology

The study adopted an ex-post-facto research design. This design was considered appropriate because the variables of interest of teachers' self-concept and students' acquisition of science process skills, had already occurred and could not be manipulated by the researcher. The targeted population of this study comprised a total of one hundred and thirty (130) chemistry teachers and one thousand nine hundred and forty-five (1945) SS2 students, from Ikom Education Zone in Cross River State, Nigeria. A sample of 300 respondents was drawn for the study. This consisted of 20 chemistry teachers and 280 SS2 students offering chemistry. A multi-stage random sampling techniques was employed in selecting the respondents. At the first stage, schools were stratified according to their locations within the zone. At the second stage, simple random sampling was used to select schools from each of the stratum. In the final stage, chemistry teachers and students were randomly selected from the chosen schools to participate in the study, at the percentage of 40% for teachers and 39% for students. Two instruments were developed and used for data collection, which include Teacher's Self-Concept Questionnaire (TSQ) and Science Process Skills Knowledge in Chemistry (SPSKC). The first instrument is a questionnaire with two sections A and B. Section A, had respondents' demographic information, section B, had 10-items contained questions that corresponds to teachers self-concept. A modified four likert scale responses of Very Adequate (VA), Adequate (A), Fairly Adequate (FA), Not Adequate (NA) with a 4 point rating. Whilst the second instrument, involves the use of science process skills Knowledge in Chemistry (SPSKC) on six (6) Basic Science Skills of Observing, inferring, Measuring, Classifying, Communicating and Predicting. The instrument face and content validity were done by experts that include chemistry teacher and lecturer from the Department of Measurement and Evaluation University of Calabar. A pilot study was conducted from a specified chemistry teachers and SS2 students outside the study zone (Calabar south local government area of Cross River State). Cronbach alpha reliability was used to measure TSQ, at the estimate of .84. While Kuder Richardson, formula (KR-20) was used to test science process skills knowledge in chemistry (SPSKC) with the reliability estimate of .72. at 0.05 level of significant. The estimated values of the internal consistency were high enough to justify the use of the instrument for the study. The researcher and his colleagues met the teachers and students at their respective classrooms there the copies of the two questionnaires were administered. At the end of the exercise, all the copies of the questionnaire were collected back by the researcher and the research assistants. For ease of data preparation, codes were designed to each item and a coding schedule was prepared by developing a key for each of the constructs of the instrument. The data collected for the study were analyzed using one way analysis of variance.

Results and Discussion

Hypothesis one

There is no significant influence of the Teachers' self-concept on Chemistry Students' acquisition of science process skills. The independent variable in this hypothesis is the Teachers' self-concept (Lows, Moderate and Highs), while the dependent variable is Chemistry Students' acquisition of science process skills. The dependent variable had seven components in this study, namely, Observing, Inferring, Measuring, Communicating, Classifying, Predicting and overall knowledge of science process skills. The statistical analysis technique deployed to test this hypothesis was the one-way analysis of variance (ANOVA). The results of the analysis are presented in Tables 1 and 2.

Research question one

What is the influence of teachers' self-concept on chemistry students' acquisition of science process skills? To answer this research question mean and standard deviation in the table 1 was used. The table 1 indicated that teachers with high self-concept had a higher mean score of 111.600 with standard deviation of 4.521 followed closely by teachers with moderate self-concept with the mean score of 106.750 with standard deviation of 5.035 and lastly followed by Teachers with low self-concept with the mean score of 102.500 and 1.520 standard deviation. The research question has been answered that teachers' self-concept influence the science process skills of their students. Though, teachers with high self-concept influence their students because their mean score was higher.

TABLE 1
Descriptive statistics of the influence of Teachers' self -concept on Chemistry Students'
Acquisition of science process skills (N=300)

Process Skills	Self-concept	N	Mean	Std. Deviation
Observing	Low	40	15.5000	.50637
	Moderate	160	19.0188	1.58797
	High	100	19.0100	1.49406
	Total	300	18.5467	1.88316
Inferring	Low	40	18.0000	.00000
	Moderate	160	18.0000	1.32703
	High	100	19.2000	1.17207
	Total	300	18.4000	1.30858
Measuring	Low	40	17.0000	1.01274
	Moderate	160	15.6250	2.40217
	High	100	17.8000	1.17207
	Total	300	16.5333	2.15973
Communicating	Low	40	16.5000	1.51911
	Moderate	160	17.5000	1.87670
	High	100	18.4000	.49237
	Total	300	17.6667	1.62203
Classifying	Low	40	20.0000	.00000
	Moderate	160	17.1250	1.62043
	High	100	17.8000	1.47710
	Total	300	17.7333	1.73366
Predicting	Low	40	15.5000	.50637
	Moderate	160	19.2500	.66351
	High	100	19.2000	.75210
	Total	300	18.7333	1.43844
Overall knowledge of science process skills	Low	40	102.5000	1.51911
	Moderate	160	106.7500	5.03447
	High	100	111.6000	4.52155
	Total	300	107.8000	5.45213

Source: Field work 2025

TABLE 2

Analysis of variance of influence of Teachers' self-concept on Chemistry Students'
Acquisition of science process skills (N=300)

Process Skills	Self-concept	Sum of Squares	Df	Mean Square	F-ratio	Sig.
Observing	Between Groups	428.413	2	214.206	100.674	.000
	Within Groups	631.934	297	2.128		
	Total	1060.347	299			
Inferring	Between Groups	96.000	2	48.000	34.269	.000
	Within Groups	416.000	297	1.401		
	Total	512.000	299			
Measuring	Between Groups	301.167	2	150.583	40.899	.000
	Within Groups	1093.500	297	3.682		
	Total	1394.667	299			
Communicating	Between Groups	112.667	2	56.333	24.823	.000
	Within Groups	674.000	297	2.269		
	Total	786.667	299			
Classifying	Between Groups	265.167	2	132.583	62.158	.000
	Within Groups	633.500	297	2.133		
	Total	898.667	299			
Predicting	Between Groups	482.667	2	241.333	527.029	.000
	Within Groups	136.000	297	.458		
	Total	618.667	299			
Overall knowledge of science process skills	Between Groups	2744.000	2	1372.000	66.322	.000
	Within Groups	6144.000	297	20.687		
	Total	8888.000	299			

* Significant at $P < .05$

Source: Field work 2025

Table 1 shows the sizes, means and SD for the three groups of respondents based on the levels of their Teachers' self-concept. The actual results of ANOVA that compared the three groups mean values are shown in Table 2. The comparison yielded F-ratios of 100.674, 34.269, 40.899, 24.823, 62.158, 527.029 and 66.322 for Observing, Inferring, Measuring, Communicating, Classifying, Predicting and overall knowledge of science process skills respectively. The seven F-ratios (for Observing, Inferring, Measuring, Communicating, Classifying, Predicting and Overall acquisition of science process skills) are each higher than the P-value at .05 level of significance, with 2 and 297 degrees of freedom. With these results, the null hypothesis is rejected in each of the seven instances of Observing, Inferring, Measuring, Communicating, Classifying, Predicting and overall knowledge of science process skills. This implies that there is a significant influence of the Teachers' self-concept on Chemistry Students' acquisition of science process skills in the seven aspects of Observing, Inferring, Measuring, Communicating, Classifying, Predicting and overall knowledge of science process skills.

In order to understand the pattern of the significant influence of Teachers' self-concept on Chemistry Students' acquisition of science process skills of Observing, Inferring, Measuring, Communicating, Classifying, Predicting and overall acquisition of science process skills, a post hoc multiple comparison analysis was carried out using Fisher's least significant difference (LSD) test. The results of these analyses are presented in Table 3.

The Post Hoc test result presented in Table 3 show that teachers' whose Teacher's self-concept is Lows are significantly different in their acquisition of science process skills in terms of Observing, Inferring, Measuring, Communicating, Classifying, Predicting and overall testing skill from those whose Teachers' self-concept is either Moderate or Highs. Also, teachers' whose Teachers' self-concept is Moderate are significantly different in their knowledge of science process skills from those whose Teachers' self-concept is Highs.

TABLE 3

Results of Fisher's least significant difference (LSD) multiple comparison analysis of the significant influence of Teachers' self-concept on Chemistry Students' Acquisition of science process skills.

Dependent Variable	(I) Teacher's self-concept	(J) Teacher's self-concept	Mean Difference (I-J)	Std. Error	Sig.
Observing	Low	Moderate	-3.51875(*)	.25786	.000
		High	-3.51000(*)	.27289	.000
	Moderate	Low	3.51875(*)	.25786	.000
		High	.00875	.18594	.962
	High	Low	3.51000(*)	.27289	.000
		Moderate	-.00875	.18594	.962
Inferring	Low	Moderate	.00000	.20922	1.000
		High	-1.20000(*)	.22141	.000
	Moderate	Low	.00000	.20922	1.000
		High	-1.20000(*)	.15087	.000
	High	Low	1.20000(*)	.22141	.000
		Moderate	1.20000(*)	.15087	.000
Measuring	Low	Moderate	1.37500(*)	.33920	.000
		High	-.80000(*)	.35898	.027
	Moderate	Low	-1.37500(*)	.33920	.000
		High	-2.17500(*)	.24460	.000
	High	Low	.80000(*)	.35898	.027
		Moderate	2.17500(*)	.24460	.000
Communicating	Low	Moderate	-1.00000(*)	.26630	.000
		High	-1.90000(*)	.28183	.000
	Moderate	Low	1.00000(*)	.26630	.000
		High	-.90000(*)	.19203	.000
	High	Low	1.90000(*)	.28183	.000
		Moderate	.90000(*)	.19203	.000
Classifying	Low	Moderate	2.87500(*)	.25818	.000
		High	2.20000(*)	.27323	.000
	Moderate	Low	-2.87500(*)	.25818	.000
		High	-.67500(*)	.18618	.000
	High	Low	-2.20000(*)	.27323	.000
		Moderate	.67500(*)	.18618	.000
Predicting	Low	Moderate	-3.75000(*)	.11962	.000
		High	-3.70000(*)	.12660	.000
	Moderate	Low	3.75000(*)	.11962	.000
		High	.05000	.08626	.563
	High	Low	3.70000(*)	.12660	.000
		Moderate	-.05000	.08626	.563
Overall knowledge of science process skills	Low	Moderate	-4.25000(*)	.80403	.000
		High	-9.10000(*)	.85091	.000
	Moderate	Low	4.25000(*)	.80403	.000
		High	-4.85000(*)	.57979	.000
	High	Low	9.10000(*)	.85091	.000
		Moderate	4.85000(*)	.57979	.000

* The mean difference is significant at the .05 level.

Source: Field work 2025

Discussion of findings

The result of the hypothesis indicate that, teachers' self-concept significantly influenced Chemistry Students' acquisition of science process skills. This was so because the calculated f-ratio obtained was .452 with p-value of .000 with 297 degree of freedom is greater than the critical r-ratio of .274 at the .05 level of significant. With this result obtained the statistical hypothesis was rejected. The result was not surprised, that teachers' self-concept had a significant positive influence with students' acquisition of science process skills, because it is expected that those who had better self-concept are supposed to be more serious in doing their teaching job and perform significantly better than those who had poor self-concept.

The findings supported Ihejiamazu et al., (2020) that conducted a research on teachers' self-concept and biology students' acquisition of process skills, they opined that teachers' self-concept is paramount to effective teaching and teachers' satisfaction. They further stated that since a teachers' self-concept is with him or her in all that the teacher does, it can obviously have an impact on the teachers' method of teaching the students, teachers' approaches to teaching is very reflective of his or her self-concept. A teachers' self is the teachers' total view of his or her cognitive, behavioral and psychological capabilities as a teacher; it is the teachers' perceptions, attitude, beliefs and values about him or herself as a teacher and how others perceive him or her in the school environment.

In support of the above, in the study by Asikong, (2023) who carried out a study to investigate the influence of teachers' self-concept on chemistry students' science process skills in Ogoja education zone. Observed that in the classroom, students are subject to the influence of the teachers' personal bias and so, teachers should have a healthy self-concept in order to create a positive classroom learning environment to facilitate healthy emotional growth and maximum intellectual development of students. The finding is also in line with other authors who have come up with different components of self-concept such as Uguwayi, (2019) believed that teachers' self-concept is a multi-dimensional construct that represent teacher self-concept as behavioral self, and identify self. According to them, behavioral self refers to the behavior of the teacher, or what he or she does which are concerned with some actions, movement or conduct. For example, teachers teach, direct, grade, lecture, instruct, move, graze, write, draw, design curricular, motion, watch, evaluate, create objectives, give speeches, and demonstrate. Identify self is the identity of the teacher views of himself or sees what or who he or she is in the school system.

Conclusion

In the light of the afore mentioned finding this study concluded that teachers self-concept, enhances teaching learning and acquisition of science process skills. Also basic science skills which are the simple scientific skills leads to the understanding of integrated or advance process skills these mentioned skills are fundamentally necessary in the scientific enterprises.

Recommendation

From the findings of this study, it was recommended that educational stakeholders should be involved in the training and re-training of teachers to enhance their self-concept in teaching skills particularly science oriented subjects.

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