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International Journal of Scientific and Allied Research
[IJSAR]

IJSAR Journal of Advancement in Education and Computing (IJSAR-JAEC)
ISSN: 2408-7661
Volume 2, Issue 4 (December 2015), 115-122
http://www.mdcjournals.org/ijsar-jaec...html

Research Article

Research on the Level of Acquisition of Science Process Skills by Junior Secondary School Students and Implication on Economic Reform and Development in Nigeria

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ABSTRACT: *The poor condition of living of Nigerian citizens coupled with the poverty level as well as the high unemployment level of the youths reveals that the recent economic reforms in Nigeria have not had serious impact on the citizens. The process skills of science are invaluable tools for the economic reform and development of any country. The acquisition of these skills has therefore been greatly emphasized in recent times. This study is focused at finding out the level of acquisition of science process skills by our Junior secondary school students and also determine the influence of school location on the acquisition of the skills. Two research questions and one hypothesis guided the study. The study was carried out using seven science process skills. The design of the study was an ex-post factor. A total sample of sixty (60) Js II basic science students drawn from both urban and rural secondary schools in Nsukka education zone of Enugu States was used. A Science Process Skill Rating Scale (SPSRS) designed by the researcher was the instrument used for data collection. The data collected were analyzed using mean and standard deviation for answering the research questions while the Analysis of Variance (ANOVA) was used for testing the hypothesis. The findings of the study revealed that the level of acquisition of the integrated process skills are generally low and that students located in urban schools were significantly superior ($p< 0.05$) to their rural counterparts in their level of acquisition of science process skills.*

Keywords: *Acquisition, Basic science, Development, Economic reform, Process skills,*

1. INTRODUCTION

Reforms especially in Nigeria's economic sector had always been a matter of concern since independence. Economic reforms are the different macroeconomic and microeconomic policies designed by the government to redress the distortion in the economy of any nation [1]. Economic reforms are not peculiar to Nigeria alone. Almost all countries world over have undertaken different forms of economic reform at one time or the other only that the contents and strategy of reforms have varied from country to country depending on the circumstance of each country [2]. Following years of economic stagnation, Nigeria embarked on a comprehensive reform programme during the second term of General Obasanjo's administration in 1999. The programme was based on the National Economic Empowerment and Development strategy (NEEDS) and focused on four main areas. These areas include improving the macroeconomic reform, structural reform, public sector reform and institutional and governance reform. The development of the NEEDS at the federal level was complemented by individual

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State Economic Empowerment and Development strategies (SEEDS) which were prepared by all the thirty six Nigerian states and the Federal Capital Territory (FCT). The NEEDs programme emphasized the importance of private sector development to support wealth creation and poverty reduction in the country.

According to [1] the federal government ensured that the NEEDS document covered the following areas.

1. Anti-corruption: In pursuance of anti corruption, the government has established regulatory agencies such as the Independent Corrupt Practices and other Related Offences Commission (ICPC) in 2000 and the Economic and Financial Crime Commission (EFCC) in 2002 to combat corruption. It has also strengthened the docile code of conduct bureau all aimed at reorganizing the machinery of governance to achieve higher levels of competence, transparency and accountability.
2. Economic: The economic reform is hinged on National) Economic Empowerment strategy (NEEDS) State Economic Empowerment and Development Strategy (SEEDS) and Local Government Empowerment and Development Strategy (LEEDS), Small and Medium Enterprise Development Agency of Nigeria (SMEDAN) and National Agency for Poverty Eradication Project (NAPEP).
3. Financial: The financial reform revolve around debt management and the consolidation of the banking and financial institution.
4. Privatization: This is anchored on the bureau for public enterprises that is charged with the responsibilities of privatizing government enterprises such as Nigeria Telecommunication Limited (NITEL), National Electric Power Authority (NEPA) etc. This is to implement fundamental economic restructuring which includes divest in government interest in key companies and Parastatals.
5. Public sector: The reform in public sector are focused on the monetization of the fringed benefits of workers and the new contributory pension scheme that is aimed towards better output of workers in the civil service.
6. Service delivery: New machinery is also being put in place to facilitate better service delivery to Nigerians. It emphasizes among other things restructured power sector, air transport sector, port services, custom services, pension scheme and tax system

In addition to the different measures packaged in NEEDS document, the document made provisions for safety nets and programme to protect the rural and urban people living with HIV/AIDS, widows, unemployment etc.

In evaluating the current economic reform in Nigeria, some individuals came out with some ideas and assertions with regards to the prospects and the challenges of the programme. For example, [3] noted that a peculiar feature of the programme is the associated inconsistency in policy implementation. [4] in their own view stated that a major challenge for the Nigerian economy is the country's large reliance on oil export earnings and weak fiscal discipline which has resulted in the reduction in competitiveness of the non-oil economy. A review of the recent economic reforms carried out by [5] revealed that although Nigeria has made significant progress with its current reform, many other challenges remain particularly in translating the benefits of reforms to citizens, in improving the domestic investment climate and in extending the reform programme to the

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state and local government levels they concluded that the current reform programme must be viewed as the initial step of a much longer journey in economic recovery and sustained growth.

In line with the ideas and views of these people, the recent economic reforms in Nigeria have not actually received full implementation and therefore have no serious impact on the lives of the Nigerian citizens. If we consider the unimproved conditions of living of citizens, the poverty level of most Nigerians, the fall in the value of naira, the fall in the demand of Nigerian oil in the international market and the unemployment level of Nigerian youths, one can easily conclude that Nigeria have a long way to go in actualizing its economic reform policies.

Science and technology is responsible for the economic development of the great nations of the world. Diversified science and technology is the major option for Nigeria to build her economy. The Nigerian government recognizes the importance of science and technology in economic development and therefore has continued to put in much effort in order to promote science. Hence, in the National policy on education [6], it is clearly stated that a greater portion of educational expenditure should be devoted to science and technology. The policy also urged universities and other levels of educational system to pay greater attention to the development of scientific orientation.

Science is studied at the Junior secondary level as Basic science the broad structure of basic science curriculum embraces not only the traditional science subject fields but also some contemporary issues such as environmental education, reproductive health education, sexually transmitted infections such as HIV/AIDS, space technology and entrepreneurship education. Although the broad based curriculum are lacking cognitive depths the contents will invariably provide the Nigerian child with the needed foundation for future specialization in science and allied fields. The bits of scientific knowledge and skills they acquire will always enable them to face life challenges, develop self survival strategies and live functionally in the global community.

Science process skills are the tools that the students use to investigate the world around them and to construct science concepts. The process skills are central to scientific thinking regardless of the biological, physical or applied science bias. They are the skills which children will apply in the practice exploration and investigation of their ideas. Science-A-Process Approach (SAPA) grouped the process skills into two, namely the Basic and the integrated process skills the basic skills include the skills of observation, Communication, classification, measurement, inference and prediction the integrated process skills include controlling variables, defining operationally, formulating hypotheses, interpreting data, analyzing data, experimenting formulating models etc. the basic skills provide a foundation for learning the integrated (more complex) skills.

The acquired process skills help the child in the meaningful exploration of his environment and therefore be in a position to solve his everyday problems. If students are helped to acquire science process skills, they will in the process develop the ability to apply them in a wide range of problems that they encounter-scientific as well as social. According to [7], the acquisition of science process skills helps the child to develop self confidence and self reliance about the understanding of the world around them. Thus, science process skills are not only the foundation for scientific inquiry but also the intellectual

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skills needed to learn concepts and broad principles used in making valid, inductive references. [8] summarized the importance of science process skills in national development as follows;

- Acquisition of science process skills enable one to take right decisions on scientific issues affecting personal and civil life the will therefore be in a better position to contribute in the economic planning of his country.
- With the application of up-to-date scientific knowledge, there will be increased productivity in the mining and refining industries. This will lead to reduction in the cost of importing and hiring skilled manpower that will undergo the different processes involved.
- Application of the skills of science leads to improvement in the areas of housing, communication, transportation etc.

With these facts, we can see that the acquisition of science process skills is very vital for achieving the goals of economic reform in Nigeria. The main focus of this paper therefore is to determine the level of acquisition of these science process skills by junior secondary skills and arts decisions on scientific issues affecting personal and civil life the will to contribute in the economic planning of his country.

- With the application of up-to-date scientific knowledge there will be increased productivity in the mining and refining industries. This will lead to reduction in the cost of importing and hiring skilled manpower that will undergo the different processes involved as our children will take up the job.
- Application of the skills of science leads to improvement in the areas of housing, communication, transportation etc.

With these facts, we can see that the acquisition of science process skills is very vital for achieving the goals of economic reform in Nigeria. The main focus of this paper therefore is to determine the level of acquisition of these science process skills by junior secondary skills and also to investigate the influence of school location on student's acquisition of science process skill.

1.1 Research Questions

1. What types of science process skills are acquired by our JSS students and to what level?
2. What is the effect of school location on students' mean rating on the level of acquisition of science process skills?

Hypothesis

There is no significant difference ($p \leq 0.05$) in the mean rating of science process skills an acquired between urban and rural students.

II. METHOD

The design adopted for this study is Ex-post factor. The population of the study comprises of all the junior secondary II (JS II) Basic science students in all the public secondary schools in Nsukka education zone of Enugu State a total of sixty (60) JS II Basic science students drawn from six out of the twenty five public secondary schools in Nsukka education zone constituted the sample. A multi-stage sampling technique was employed. The instrument used for data collection is the

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Science Process Skill Rating Scale (SPSRS) which was developed by the researcher. The instrument was face validated by three university senior lectures that are in science education.

A test of reliability using Cranach Apha was conducted to determine the internal consistency of the instrument. Also the kendall's coefficient of concordance was used to establish the inter-rater reliability index. The overall inter- rater reliability coefficient was determined to be 0.8 while the Cranach alpha reliability coefficient of 0.8 was found. Two trained secondary school basic science teachers assisted the researcher in the administration of the instrument. Mean and standard deviation was used in answering the research questions while one way Analysis of variance (ANOVA) was used for testing the hypotheses at $p<0.05$.

III. RESULTS

The results of the study were presented based on research questions and corresponding hypotheses TABLE 1 presents the data elicited by research question 1.

Table 1: The Mean Rating of the JSS Student's Level of Acquisition of the Science Process Skills under Study

TYPE OF SKILL	MEAN RATING	LEVEL	INTERPRETATION
Observation	3. 31	High	Acquired
Measuring	3. 26	High	Acquired
Classifying	3. 58	Very high	Acquired
Communicating	3. 08	High	Acquired
Inferring	2. 45	Low	Not acquired
Experimenting	2. 63	Low	Not acquired
Interpreting	2. 38	Low	Not acquired

Decision Rule: Mean rating less than 3 is low and therefore not acquired. Mean rating greater than or equal to 3 is high and therefore is acquired.

Data presented in TABLE 1 indicate that the mean rating of the students in the level of acquisition of the skills is 3.31 (for the skill of observing), 3.26 (for measuring) 3. 58 (for classifying), 3.08 for (communicating) 2. 45 (for inferring), 2.63 (for experimenting) and 2.38 (for interpreting data). Thus, the students acquired the skills of observing, measuring, classifying and communicating while the skills of experimenting, inferring and interpreting data were not acquired by the students. The Table also showed that the skill of classifying was very highly acquired.

The data generated for research question 2 is presented in TABLE 2 below

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Table 2: The Mean Rating and Standard Deviation of Urban and Rural Student's Level of Acquisition of Science Process Skills.

Science process	Mean rating of urban students	S.D	Mean Rating of rural students	S.D
Observation	36. 70	8. 15	29. 53	11.59
Measuring	36. 26	10.38	29. 10	8. 70
Classifying	41. 10	9.54	30. 60	11. 60
Communicating	37. 33	37. 33	12. 44	6. 31
Inferring	30. 00	10. 37	25. 16	6. 93
Experimenting	30. 83	10. 00	24. 90	9. 46
Interpreting Data	34. 83	11. 34	20. 86	20. 86
Overall mean	34. 29	7. 68	29. 56	6. 86

TABLE 2 reveals that the students from urban schools had a higher mean rating in all the seven process skills than the students from rural schools. Their over all mean rating of 34. 29 is also higher than the mean rating of 29. 56 for students from rural schools.

The data generated for hypotheses 1 are presented in TABLE 3 below

Table 3: Summary of One Way Analysis of Variance (ANOVA) of Students Mean Rating on the Level of Science Process Skill Acquisition According to School Location.

SKILL	**SOURCE OF VARIATION**	**SUM OF SQUARES**	**D/F**	**MEAN SQUARE**	**F-RATION**	**F- PROB**
Observation	School location	770. 41	1	770.41	7.66	0.07
Measuring	School location	770.41	1	770.41	8.34	0.05
Classifying	School location	1653.75	1	1653.75	14.62	0.03
Communicating	School location	2509.06	1	2509.06	25.77	0.00
Inferring	School location	350.41	1	350.41	4.50	0.03
Experimenting	School location	2912.06	1	2912.06	30-70	0.00
Interpreting data	School location	2926.01	1	2926.01	35.91	0.00

TABLE 3 shows the ANOVA results of urban and rural students' mean rating of the level of acquisition of observing, measuring, classifying, communicating, inferring, experimenting, and interpreting data. Of the seven process skills from table

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3, it is seen that the calculated value of F- ratios with respect to school location are 7. 66 for observing, 8. 34 for measuring, 14. 62 for classifying, 25. 91 for interpreting data while the table values for those skills are 0. 07, 0.05, 0.03, 0.00 0.03, 0.00 and 0.00 respectively. Thus table 3 reveals that the calculated value of F-ratio in all the seven skill categories are higher than the table value for 1 degree of freedom at 0.05 level of significance. This indicates a statistical difference between the mean rating of urban and rural students in their level of acquisition of science process skills. Thus the above stated null hypothesis was rejected.

IV. DISCUSSION.

Evidence obtained with respect to the first research question showed that students generally show high level of acquisition of the basic process skills of observing, measuring, classifying and communicating as measured by their mean rating using the Science Process Skills Rating Scale (SPSRS). The students are also seen to show a low acquisition of the skills of experimenting, inferring and interpreting data which are the higher order or integrated process skills. The results of this study is in line with the views of [9] who indicated that the student's level of acquisition of science process skills was highest for the skill of classification followed by observation while the skills of prediction, inference and interpreting data reveled very low scores and hence low acquisition. This low level of acquisition of science process skills by the JSS students has some implications for scientific and technological development in Nigeria.

The influence of school location was investigated and the evidence obtained showed that the urban students were significantly higher mean rating than their rural counterparts on the level of acquisition of science process skills.

One possible explanation for this result may be the fact that science laboratories of rural secondary schools are known to be less well equipped and also to have few teaching staff than their urban school counterparts. As long as these imbalances in teaching resource allocation to secondary schools persist to the disadvantage of the rural schools, so would low achievements by students in rural schools remain.

VI. CONCLUSION

Science and technology are responsible for the economic development of the great nations science process skills are the tools that students use to investigate the world around them and therefore be in a better position to solve the problems they encounter within the society. The level of acquisition of integrated process skills among JSS students was generally how. Moreover, students from the urban schools have higher acquisition of the process skills than their rural counterparts. This condition posses a serious problem because it hinders the children from participating in meaningful economic growth and development in Nigeria.

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V. RECOMMENDATIONS

1. Since the mean rating of students' level of acquisition of integrated process skills are how, there may be need to retrain teachers in integrated process skill tasks. This retraining will in turn cub off the low acquisition of the skills by the students.
2. Qualified and experienced teachers should be employed to teach science in rural schools.
3. There is a need to recognize the disparity of resources allocated in rural and urban secondary schools and so put in place a deliberate government policy whereby a special resource allocation are made available to the rural secondary schools to enable these schools teach sciences to their students more effectively and realistically.
4. Workshops, seminars and conferences should be organized at regular intervals for science teachers at the JSS to enable them update their scientific knowledge

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