



## Problem Solving Skills in Basic Science among Junior Secondary School Students in Kafanchan, Kaduna State, Nigeria

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### ABSTRACT

*This study investigated the level of Problem Solving Skills among junior secondary school basic science students in Kafanchan, Kaduna state. Three research questions and two null hypotheses guided the study. The study adopted a descriptive survey design. A sample of 75 made up of 42 male and 33 female students were used for the study. The instrument used for data collection was 20 items rating scale. The research questions were answered using mean and standard deviation while null hypotheses were tested using t-test statistic. The findings of the study revealed that the level of Junior Secondary Students' problem solving skills in Basic Science was that male students show high level of problem solving skills than female students. Likewise, the junior secondary school student from urban location demonstrated high level of problem solving skills in basic science than the students from rural location. The study further revealed that, there is significant difference between rural and urban Junior Secondary students mean level of problem solving skills in Basic science among others. Based on the findings, the researcher recommended that Basic Science teachers should present the problem solving skills in clear terms starting from simple to complex in order for the students to acquire them. They should also direct more attention to female students to make them improve on the problem solving skills to enhance performance in Basic science. Schools in rural areas should be adequately equipped with teachers and should adopt methods that will assist students getting the appropriate skills and that basic science concepts should be skill oriented so that students will do science instead of learning about science, among others.*

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### INTRODUCTION

Science consist of an organized body of knowledge, an attitudinal disposition, as well as a process and activity. According to Yanpar (2007) science deals with practical application of ideas through manipulation of materials in such a manner leading to discoveries. The contributions of science to overall development of all nations

cannot be over emphasized. This is the reason why science holds an important position in the curriculum of Nigeria Educational System (Federal republic of Nigeria, (FRN), 2014). Therefore, the teaching and learning of science would require the acquisition of problem solving skills, (Njelita 2008).



Problem solving skills (PSS) are transferable skills that are applicable to many sciences and reflect the behaviour of science. According to Ozgelen (2012), problem solving skills are thinking skills that scientist use to construct knowledge in order to solve problem and formulate results. Sevilay (2011), posits that the mastery of problem solving skills enable students to conceptualize at a much deeper level, the content they do not know and equip them for acquiring content knowledge in the future. The skills facilitate learning in physical science and ensure active participation of students' in practical situation. The problem solving skills form the foundation for scientific methods.

According to Ibe (2004), the American Association for Advancement of Science (AAAS) came up with fifteen (15) problem solving skills. These include:

1. Observation
2. Measurement
3. Classification
4. Quantification
5. Inferring
6. Predicting
7. Relationships
8. Communication
9. Interpreting data
10. Questioning
11. Controlling variables
12. Operational definitions
13. Hypothesizing
14. Experimenting
15. Recording

However, this study will be concerned with five (5) science problem solving skills out of the fifteen (15) proposed by AAAS. The reason for the choice of is in line with Ajunwa (2000) who argued that problem solving skills, such as measurement, observing, classifying, experimenting and recording are crucial for the development of a meaningful understanding of scientific concepts, proposition and for a meaningful

use of scientific procedures for problem solving. Therefore, these skills seem to be very important individually as well as when they are integrated together. Furthermore, it has been maintained that the basis of learning how to recognize, define and to some extent, solve individual and social problems is learning how to again problem solving skills (Aktam and Ergin, 2007). This means that problem skills are inseparable in practice from the conceptual understanding that is involved in the leaning and application of science. Affirming this, Omajuwa (2011), reported that out of the 15 problem solving skills recommended for science curricula, about 70% of the students still experience difficulties in acquiring them.

In this context, acquisition of these problem solving skills could help the learner to develop self-confidence and self-reliance about the understanding of the world around. Koray (2006) opined that more scientific problem solving skills that featured in Basic Science curriculum help students grasp concepts, adopt attitudes, and improve skills related to Basic science learning.

Basic science is one of the core subjects for basic education and is a foundation of subsequent science learning. It exposes students to basic skills of scientific enterprises and provides the learner with necessary skills required for learning of science which is the foundation on which subsequent science learning is built (Okeyefi & Nzewi, 2015).

Educationist have proposed different definition of the subject Basic science. Datom (2015) saw Basic Science as a grassroot subject that introduces children into the field science, considering it integrated name between the core science subjects. The knowledge of Basic Science is a pre-requisite to further learning in other physical sciences such as physics, Chemistry and Biology. A good foundation in the field of Medicine, Engineering Pharmacist,



Agriculture to mention just a few (Shuaibu, 2012). Considering the importance of Basic Science in the field mentioned above, the Federal Government of Nigeria in National Policy on Education (2014) emphasized the need for planned experience that will build the child understanding in the subject. The philosophy of the subject is to prepare the learner for future learning experience in physical sciences.

The teaching and learning of basic science require problem solving skills, which enhance student performance. At the Junior Secondary school level, academic performance and students' problem solving skills in Nigerian Junior Secondary Schools has been a subject of concern to stakeholders such as educators, parents, administrators and researchers. Reports indicates that students' performance in Basic Science is not encouraging. Reason is lack of interest, lack of qualified teachers, lack of practical activities, insufficient time allocated for basic science on the time table as well as poor teaching methods employed to teach the subject (SUBEB 2018). Likewise, it has been argued that location is among the major factors that influence students' performance in terms of problem solving skills with respect to basic science concepts. Reports indicates that schools in urban are better equipped with apparatus than schools in the rural areas. Also, there is no common consensus as to whether gender is another factor that affects the problem solving skills in basic science and this tends to suggest that the problem solving skills for male and female basic science students may vary. This research work therefore, attempts to investigate the problem solving skills on performance among junior secondary school basic science students in Kafanchan Zone, Kaduna state.

### **Purpose of the Study**

The general purpose of this study is to investigate Junior secondary school Basic

Science students' in Problem Solving skills in Kafanchan, Kaduna State.

Specifically, the study sought to:

1. Determine the Junior Secondary school students' Problem Solving skills application in Basic science concept
2. Ascertain the difference in the male and female Junior Secondary school Students in terms of problem solving skills application in Basic science concepts
3. Assess the difference in the rural and urban junior secondary school students in terms of problem solving skills application in basic science concept

### **Research Questions**

The following research questions guided the study:

- i. What are the problem solving skills possessed by the Junior secondary school Students in basic science?
- ii. What is the difference in the male and female junior secondary school students in terms of their problem solving skills in basic science?
- iii. What is the difference in the rural and urban Junior secondary school students in terms of their problem solving skills in basic science?

### **Research Hypotheses**

The following null hypotheses were formulated and tested at alpha level of 0.05

**H<sub>01</sub>** There is no significant difference between the mean level of male and female junior secondary school students' problem solving skills in basic science concepts

**H<sub>02</sub>** There is no significant difference between urban and rural Junior secondary school students' mean level in problem solving skills acquisition in basic science concept.

### **METHODOLOGY**

This study adopted a descriptive survey design. The population comprises of



all JSS III within Kafanchan zonal education totaling one thousand five hundred and twenty (1,520). Five schools were randomly selected using balloting giving a sample size of seventy-five (75) consisting of fifteen students from each school. The instrument used for data collection was named problem Solving skills Rating Scale (PSRS) which was validated by expert and pilot tested over sample of students that do not took part in the study. To elicit information for the study. Students were grouped into five group with a basic science teacher as research assistant in each of the five schools. Research assistants were given rating scales to observe the students as they carry out practical to demonstrate their skills.

The research instrument, (PSRS) was used to assess the Junior Secondary School Students of the five Problem Solving Skills under study. Two basic science teachers in each school were taken as research assistant and were trained for two days on how to use the rating scale. The Basic Science Students in each school were

divided into five groups for conveniences of assessment. Each research assistant was given copies of the rating scale based on the number of students assigned to him or her in each group. The students in each group were invited into the Basic Science laboratory and were given forty minutes to demonstrate their skill with respect to the selected science problem-solving skills based on the instructions on the practical manual. The research assistants carried out a direct observation on the student's ability to demonstrate their competence in the five Problem-solving science skills under study. The problem-solving scale was used to score the performance of each student on every process skill observed. Data collected were recorded, coded and subjected statistical analysis.

## RESULTS

**Research Question One:** What are the Junior secondary school students' problem solving skills possessed in basic science?

**Table 1:** Mean and Standard Deviation on the level Problem Solving Skills of Students in Basic science

SN	Skills	X	SD	Remark
1.	Observation	2.12	0.82	Fair
2.	Measurement	2.38	1.06	Fair
3.	Experimenting	2.42	1.04	Fair
4.	Classifying	2.58	0.86	Good
5.	Recording	2.54	1.02	Good
	Over Mean	2.44	0,96	Fair

The table 1 above shows the mean and standard deviation of students' level of problem solving skills in basic science. The data on the table shows that the students demonstrate fair ability in observing with mean score of 2.12 and 0.82 SD. The result also revealed that students possess low skills in measuring with mean score of 2.38 and SD 1.06 as well as fair ability in skills of experimenting with a mean score of 2.42 and SD 1.04. On the other hand, the data on

the table showed that students demonstrated good skills in recording with a mean rating of 2.54 and SD 1.02 and classifying with mean rating of 2.58 and SD 0.86.

From the data presented, it is observable that students demonstrated low level of science process skills in most of the items in the cluster. Also, it indicated that students displayed fair problem solving skills as shown in their overall mean of 2.44 and



SD 0.96 respectively. These imply that students demonstrated low skills in areas like observing, measurement and experimenting, representing 60 level of low science process Skills.

**Research Question Two:** What is the difference in the male and female junior secondary school students in terms of problem solving skills possessed in basic science?

**Table 2:** Mean and Standard Deviation on the level male and female Students' Problem Solving Skills in Basic science

Gender	X	SD	Remark
Male	2.64	0.31	Good
Female	2.49	0.40	Fair

Table 2 shows the difference between Junior secondary school male and female students' level of problem solving skills in basic science, from the table above, male students have mean rating of 2.64 with SD 0.31 while female have mean of 2.49 with 0.40. This data implies that male students demonstrated good problem solving skills compared to female students. Therefore,

the table revealed that there is difference between male and female students' level of problem solving skills in basic science.

**Research Question Three:** What is the difference in the rural and urban Junior secondary school students in terms of problem solving skills possessed in basic science?

**Table 3:** Mean and Standard Deviation on the level Urban and rural Students' Problem Solving Skills possessed in Basic science

Location	X	SD	Remark
Urban	2.65	0.31	Good
Rural	2.47	0.40	Fair

Table 3 shows the difference between Urban and Rural Junior secondary school students' level of problem solving skills in basic science. From the table above, Urban areas have mean rating of 2.65 with SD 0.31 while Rural have mean of 2.47 with 0.40. This data implies that students from Urban areas demonstrated good knowledge of problem solving skills compared to those students from Rural areas. Therefore, the

table revealed that there is difference between Urban and rural students' level of problem solving skills in basic science.

**Hypotheses One:** There is no significant difference between the mean level of male and female junior secondary school students' problem solving skills in basic science concepts

**Table 4:** Independent t-test analysis of male and female students' on Problem Solving Skills in Basic Science

Gender	N	X	SD	Df	t-cal	Sig-t	Remark
Male	42	2.64	0.31	73	2.98	0.03	Rejected
Female	33	2.49	0.40				

From table 4 above, the calculated t-value at 73 degree of freedom and 0.05

level of significance is 2.98. Since the calculated value is 2.98 and is significant at



0.03; the value is also significant at 0.05. This is because 0.01 is less than 0.05 ( $P=0.01$ ;  $p<0.05$ ). Therefore, the hypothesis was rejected; hence, there is significant difference between the mean level of male and female students.

**Hypothesis Two:** There is no significant difference between urban and rural junior secondary school students' mean level on problem solving skills in basic science concept

**Table 5:** Independent t-test analysis of Urban and Rural students' on Problem Solving Skills in Basic Science

Gender	N	X	SD	Df	t-cal	Sig-t	Remark
Urban	45	2.65	0.31	73	2.92	0.01	Rejected
Female	30	2.50	0.40				

From table 5 above, the calculated t-value at 73 degree of freedom and 0.05 level of significance is 2.92. Since the calculated value is 2.92 and is significant at 0.00; the value is also significant at 0.05. This is because 0.01 is less than 0.05 ( $P=0.00$ ;  $p<0.05$ ). Therefore, the hypothesis was rejected; hence, there is significant difference between the mean level of urban and rural students in basic science.

#### SUMMARY OF FINDINGS

From the results of the findings of the study, the following are summaries of the major findings:

1. There is statistical significant difference in the mean rating of male and female basic science students in terms of their problem-solving science skills possessed.
2. There is statistical significant difference in the mean rating of urban and rural basic science students in terms of their problem-solving skills possessed.

#### CONCLUSION

Arising from the findings of this study, it could be concluded that, Junior Secondary School students demonstrated low skills in areas like observing, measuring and experimenting. More so, male students demonstrated high level of problem solving skills in basic science than the female

counterpart. However, students from urban area demonstrated high level of problem solving skills in basic science compared to students from rural areas.

#### RECOMMENDATIONS

From the findings of this study, the following recommendations are made:

1. Basic Science teachers should present problem solving skills in clear terms, starting from simple to complex. This is to enable students acquire them.
2. Basic science teachers should direct more attention to female students for improvement on their problem solving skills acquisition to enhance their performance.
3. School in rural areas should be well equipped with modern facilities to enhance students' performance in basic science through acquisition of appropriate problem solving skills.
4. Government/Ministry of Education and Professional Organization like STAN should organize workshops, seminars and conferences for basic science teachers to update them on problem solving skills acquisition.

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