SCIENCE PROCESS SKILLS PERCEIVED DIFFICULT TO TEACH BY UPPER BASIC
SCIENCE TEACHERS IN KWARA STATE, NIGERIA

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Abstract

Effective teaching and learning of basic science require an understanding of Science Process Skills (SPS) to guarantee meaningful learning. The focus and objective of this study was to investigate the science process skills perceived difficult to teach by upper basic science teachers in Kwara State, Nigeria. Specifically, the objectives of this study were to investigate the perceptions of upper basic science teachers in Kwara State on: (i) the science process skills perceived difficult to teach; (ii) the reasons adduced for perceiving them as difficult to teach or not difficult to teach and (iii) the influence of teachers experience on the science process skills perceived difficult to teach. The study was a descriptive research of the survey type. The population for the study was all upper basic science teachers in Kwara State. A sample of 1005 upper basic science teachers, drawn from three Senatorial Districts of Kwara State, Nigeria, was used to obtain needed data, the percentage, and Chi-square statistics were used to test the hypotheses.

Findings of the study were that:

  i.   *Upper basic science teachers perceived science process skills to be difficult to teach.*
  ii. *Reasons adduced by the teachers for perceiving the process skills difficulty to teach were the complexity of the process skills (27.41%), abstractness (24.48%), and lack of practical skills (21.59%).*
  iii. *Teachers' years of teaching experience have no significant influence in their perceptions of upper basic science teachers on the difficulty in teaching science process skills*
  iv. *Teachers' years of teaching experience significantly influenced their reasons adduced for perceiving science process skills to be difficult to teach.*

The study concluded that basic science teachers in Kwara State, Nigeria perceived SPS difficult to teach and teachers'' years of teaching experience significantly influenced their reasons adduced for perceiving science process skills to be difficult to teach. The implication is that teachers might find it difficult to impart science process skills on the students as they do not understand the SPS. The study recommended that adequate training should be given to teachers on SPS, irrespective of gender stereotype, to foster an in-depth understanding of the skills.

Key words: Teaching Experience, Science Process Skills (SPS), Perception, Difficult, Upper Basic, Science Teachers.

Introduction

Nigeria, like any other developing nation of the world, needs to create a society that is scientifically oriented, progressive and knowledgeable. That is, a nation that has a high capacity for change and forward-looking, innovative and capable of contributing to the scientific and technological developments in the future. In this connection, there is a need to produce citizens who are creative, inquisitive, open-minded and competent in science and technology (Adeyemi, 1999).Ogunleye (2001) observed that the level of technological development of a society is a measure of the level of scientific literacy obtainable in that society. Although the crave for scientific and technological advancement by Nigerians has been a common issue in the society; the aspiration of the country to launch itself into the mainstream of scientific achievers cannot be accomplished unless science is taught and learned in a better and fascinating practical form (Adeyemi, 1999). One of fundamental approaches for the effective teaching of science and development of technology in any society is an application of science process skills.

Karsli, Sahin and Ayas (2010) stated that science process skills are the skills used by scientists for composing knowledge, thinking of problems and making conclusions. Science process skillsare commonly used as popularized by the curriculum project, Science--A Process Approach (SAPA). Science Process Skills were grouped into types--basic and integrated skills. The basic skills provide the foundation for learning the complex skills. This may be probably one of the reasons why educators have been showing tremendous concern on students' attitudes to the learning of science subjects in Nigeria (Afolabi&Ige, 2007).

For educators to teach these science process skills effectively, it is required that they have a good understanding of them and be able to identify the different Science Process Skills that constitute procedural understanding, as well as to plan and provide opportunities for learners to practice these skills individually within activities where learning intentions are

related explicitly to the chosen process skills (Ward, Roden, Hewlett & Foreman, 2008).Therefore, the use and development of science process skills at the classroom level will be influenced by the educator's views of these domains, as well as their understanding about the basic skills to be taught. That is so because educators with a particular understanding of these skills will consciously or unconsciously shape their teaching in line with this understanding or view (Wenham, 2005).

Ron (2008) opined that learning affects our perceptions. This is because once you learn something; it is catalogued in your brain forever. He added that as we grow up, we learn either by doing, figuring out or we are taught what we need to know.Perception also influences the difficulty in the acquisition of knowledge.

Difficult topics or concepts as perceived by teachers are always reflected in their teaching. The difficulty of a topic or concept either in teaching or learning is a familiar issue to early research. Researchers' views have earlier showed that teacher/students perceived some branches of science difficult. Among these are Opobiyi (1996) difficulties in chemistry Okpala (1985), Fakuade (1973) difficulties in mathematics and Ogunniyi (1977) difficulties in scientific concepts.

Experience in any profession is considered as an asset. Lieberman (2000) reported that the experience of a teacher gives confidence and improves performance in teaching, motivating, encouraging and leading students. According to Ogunleye, (2005) teachers' qualification and experience havea strong connection with their performance in job.

Submitting, Awoyemi (1985) concluded that teachers are generally effective within the first ten years of teaching experience, while anything outside ten years, there is a tendency for a slight decline in productivity.

It is impossible for students to obtain needed information without having the necessary skills in any of the sciences and technological disciplines (Karsli, Sahin, & Ayas,

2010). Hence, there is the need for science teachers to acquaint science students, irrespective of their gender, with the necessary skills to acquire scientific knowledge, technological skills and not just to teach the concepts alone.

Due to the experience played by upper basic school science teachers in the teaching of science process skills perceived difficult to teach, experience is worth investigating.

Statement of the Problem

Science process skills are very fundamental to science teaching and learning but there is still a serious educational gap in bringing these skills into the classroom for both teachers' and students' acquisition (Harlen, 1999). Science process skills are considered as a major goal for the teaching of basic science, since science education enhances the learners' ability to learn with meaningful understanding.

Purpose of the Study

The main purpose of this study was to find out science process skills perceived difficult to teach in basic science by upper basic school science teachers in Kwara State, Nigeria.

Specifically, the study investigated the:

1. perceptions of upper basic science teachers on science process skills difficult to teach in Kwara State, Nigeria;

2. reasons adduced for perceiving science process skills difficult to teach by the upper basic science teachers in Kwara State, Nigeria;

3. influence of teachers' years of teaching experience on the perceptions of upper basic science teachers on science process skills difficult to teach in Kwara State, Nigeria.

Research Questions

The following research questions were raised to guide the conduct of this study.

1. what are the perceptions of upper basic science teacherson science process skills difficult to teach in Kwara State, Nigeria?;

2. what are the reasons adduced for perceiving science process skills difficult to teach by the upper basic science teachers in Kwara State, Nigeria?;

3. do teachers' years of teaching experience influence the perceptions of upper basic science teachers on science process skills difficult to teach in Kwara State, Nigeria?;

Research Hypotheses

The following research hypotheses were tested in this study:

$H0_1$:   there is no significant difference in the perceptions of upper basic science teachers and science process skills difficult to teach based on teachers' years of teaching experiences in Kwara State, Nigeria.;

$H0_2$:   There is no significant difference in the perceptions of upper basic science teachers and the reasons adduced for perceiving science process skills difficult to teach based on teachers' years of teaching experiences in Kwara State, Nigeria.;

Methodology

This study wasa descriptive research using survey type.The population for this study comprised all the public upper basic science teachers in Kwara State, Nigeria.Proportionate, simple random and purposive sampling techniques were used for selecting sample for this study. The proportionate, simple random sampling technique was used for selecting the schools in order to have representation in each of the Senatorial Districts.The instruments used in this study was a researcher-developed questionnaire entitled "Teachers Perceptions on difficulty of Science Process Skill (TPSPS)"

The data collected was analyzed using descriptive statistics of the percentage to answer research questions and inferential statistics of Chi-square analysis to test research hypotheses.

Results

Research Question 1: What are the perceptions of upper basic science teachers on science process skills difficult to teach in Kwara State, Nigeria?

The responses of the respondents to research question one are presented in Table 1. 419 (41.69%) perceived all the fifteen listed science process skills as not difficult to teach, 322 (33.03%) of the sampled upper basic science teachers perceived all fifteen science process skills as moderately difficult to teach. Also, 196 (19.50%) perceived all the fifteen science process skills as difficult to teach, while 68 (6.77%) upper basic science teachers sampled perceived all the fifteen science process skills as very difficult to teach.

Therefore, the findings from Table 1 shows that majority of sampled upper basic science teachers (58.31%) perceived all the fifteen science process skills difficult to teach, while (41.69%) perceived science process skills not difficult to teach.

Table 1

Perceptions of Upper Basic Science Teachers on Science Process Skills Difficult to Teach

S/N	ITEMS	ND	MD	D	VD	df	X^2_{cal}	X^2_{tab}	Remark
1.	Observing	393 (39.10)	349 (34.70)	233 (23.20)	30 (3.00)	3	314.16	7.82	S
2.	Classifying	596 (59.30)	349 (34.70)	45 (4.41)	15 (1.50)	3	902.53	7.82	S
3.	Inferring	393 (39.10)	349 (34.70)	233 (23.20)	30 (3.00)	3	314.16	7.82	S
4.	Predicting	366 (36.40)	391 (38.90)	218 (21.70)	30 (3.00)	3	329.37	7.82	S
5.	Measuring	725 (72.10)	205 (20.40)	45 (4.50)	30 (3.00)	3	1265.94	7.82	S
6.	Communicating	379 (37.70)	282 (28.10)	192 (19.10)	148 (14.70)	3	123.30	7.82	S
7.	Control variable	309 (30.70)	318 (31.70)	364 (36.20)	14 (1.40)	3	318.47	7.82	S
8.	Interpreting data	466 (46.40)	260 (25.90)	206 (20.50)	73 (7.30)	3	305.64	7.82	S
9.	Making operational definition	278 (27.70)	480 (47.8)	232 (23.10)	15 (1.50)	3	434.73	7.82	S
10.	Formulating Hypotheses	293 (29.2)	288 (28.70)	263 (26.20)	161 (16.00)	3	45.28	7.82	S
11.	Experimenting	419 (41.70)	307 (30.50)	250 (24.90)	29 (2.90)	3	320.97	7.82	S
12.	Counting Numbers	584 (58.10)	248 (24.70)	102 (10.10)	71 (7.10)	3	658.70	7.82	S
13.	Raising	508	309	101	87	3	472.87	7.82	S

	questions	(50.5)	(30.70)	(10.10)	(8.70)			
14.	Manipulative technique	232 (23.10)	276 (27.50)	305 (30.30)	192 (19.10)	3	29.38	7.82	S
15.	Building Mental Models	368 (36.6)	405 (40.30)	145 (14.40)	87 (8.70)	3	300.64	7.82	S
	Cumulative	419 (41.7%)	322 (32.5%)	196 (19.5%)	68 (6.7%)	3	277.73	7.82	S

Key: ND (Not Difficult to Teach), MD (Moderately Difficult to Teach), D (Difficult to Teach) and VD (Very Difficult to Teach).

Research Question 2: What are the reasons adduced for perceiving science process skills difficult to teach by the upper basic science teachers in Kwara State, Nigeria?

The responses of the upper basic science teachers to research question two are presented in Table 2, the benchmark considered for the reasons adduced as significant, i.e., Any reason ≥ 20% was the level of acceptance.

From the analysis in Table 2, 276 (27.46%) upper basic science teachers adduced the reasons for perceiving all the listed fifteen science process skills difficult to teach as due to complexity of the skill, 246 (24.48%) as due to abstractness of the skill. Also, they adduced lack of practical skills (21.59%), while 186 (18.51%) adduced the reasons for perceiving science process skills as due to unavailability of laboratory facilities and 80 (7.96%) of the upper basic science teachers sampled adduced the reasons for perceiving science process skills as due to the fact that teachers did not train in science process skills during teacher education.

Therefore, the findings in Table 2 show that the most significant reasons why basic science teachers in Kwara State had difficulty in teaching science process skills were complexity (27.46%), abstractness (24.48%) and lack of practical skills (21.59%).

Table 2

Perceptions of Upper Basic Science Teachers on the Reasons Adduced for Perceiving Science Process Skills Difficult to Teach.

S/N	ITEMS	CS	AS	LS	UF	TN	df	x^2_{cal}	x^2_{tab}	Remark
1	Observing	55	99	411	274	166	4	409.82	9.49	S
2	Classifying	48	95	417	281	164	4	443.13	9.49	S
3	Inferring	394	248	217	117	29	4	379.87	9.49	S
4	Predicting	204	410	217	89	85	4	347.99	9.49	S
5	Measuring	353	246	175	173	58	4	234.80	9.49	S
6	Communicating	249	363	176	173	44	4	271.67	9.49	S
7	Controlling variable	333	296	187	87	102	4	245.98	9.49	S
8	Interpreting Data	322	159	190	249	85	4	160.63	9.49	S
9	Making Operational definition	364	276	145	177	43	4	302.84	9.49	S
10	Formulating Hypotheses	336	220	233	201	15	4	269.68	9.49	S
11	Experimenting	321	222	189	244	29	4	230.94	9.49	S
12	Counting Numbers	348	279	159	177	42	4	275.19	9.49	S
13	Raising Questions	277	381	131	174	42	4	343.71	9.49	S
14	Manipulative technique	349	221	232	116	87	4	216.35	9.49	S
15	Building mental models	176	161	189	261	218	4	31.13	9.49	S
	Cumulative	**276 (27.5%)**	**246 (24.5%)**	**217 (21.6%)**	**186 (18.5%)**	**80 (7.9%)**	**4**	**113.29**	**9.49**	**S**

Key: CS (Complexity of Science Process Skill), AS (Abstractness of Science Process Skill), LS (Lack of Practical Skill), UF (Unavailability of Laboratory Facilities) and TN (Teachers did not Learn Science Process Skills)

Research Question 3: Do teachers' years of teaching experience influence the perceptions of upper basic science teachers on science process skills difficult to teach in Kwara State, Nigeria?;

Table 3 shows that there is no significant difference in the perceptions of upper basic science teachers on the difficulty in teaching science process skill based on teaching experience. The Chi-square value is as follows x^2 (6)=x^2_{cal} 25.28>x^2_{tab} 12.59. Since the calculated x^2 value which is 25.28 is greater than the table x^2 value which is 12.59.it means that there is no significant difference in the perceptions of upper basic

science teachers on the difficulty in teaching science process skills based on teachers' years of teaching experience. The null hypothesis formulated therefore not rejected.

Out of fifteen items considered for the analysis, eleven of the items showed no significant differences in the perceptions of upper basic science teachers on the difficulty in teaching science process skills based on teachers' years of teaching experience. The eleven science process skills are observing, classifying, inferring, predicting, measuring, controlling variable, operational definition, formulating hypothesis, experimenting, manipulative technique and building mental models.

While 4 of the items contributed significantly are: communicating, interpreting data, counting numbers and raising questions.

Table 3

Chi-square Analysis on the Perceptions of Upper Basic Science Teachers on the Difficulty in Teaching Science Process Skills Based on Teachers' Years of Teaching Experience

S/N	ITEM	Less Experienced Observed and Expected				Moderately Experienced Observed and Expected				Experienced Observed and Expected			
		ND	MD	D	VD	ND	MD	V	VD	ND	MD	D	VD
1.	Observing	249 (234.00)	120 (138.20)	88 (93.20)	75 (66.70)	141 (159.60)	107 (94.30)	72 (63.60)	75 (66.70)	52 (48.40)	34 (28.60)	16 (19.30)	8 (13.80)
2.	Classifying	252 (231.00)	117 (139.20)	92 (97.40)	71 (63.50)	138 (158.20)	110 (95.00)	74 (66.50)	41 (43.30)	48 (47.90)	36 (28.80)	18 (20.10)	8 (13.10)
3.	Inferring	122 (136.60)	251 (235.60)	86 (94.80)	73 (65.10)	108 (93.20)	138 (160.70)	75 (64.70)	42 (44.40)	28 (28.20)	56 (48.70)	18 (19.60)	8 (13.50)
4.	Predicting	256 (238.20)	132 (132.90)	86 (96.90)	74 (64.10)	138 (162.50)	107 (90.70)	79 (66.10)	39 (43.70)	56 (49.30)	28 (27.50)	18 (20.00)	8 (13.20)
5.	Measuring	132 (130.20)	248 (238.20)	88 (92.60)	64 (70.90)	88 (88.90)	138 (162.50)	74 (63.20)	63 (48.40)	26 (26.90)	64 (49.30)	13 (19.20)	7 (14.70)
6.	Communicating	237 (242.40)	156 (144.00)	84 (84.00)	55 (60.90)	164 (165.40)	87 (98.20)	61 (57.80)	51 (41.50)	57 (50.10)	29 (29.80)	15 (17.50)	9 (12.60)
7.	Controlling variable	30 (40.80)	501 (60.90)	284 (267.30)	167 (163.00)	34 (27.80)	46 (41.50)	178 (182.40)	105 (111.20)	13 (8.40)	18 (12.60)	43 (55.30)	36 (33.70)
8.	Interpreting	246	208	57	21	190	115	43	15	50	42	12	

#		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
	data	(257.30)	(193.20)	(59.30)	(22.20)	(175.50)	(131.80)	(40.50)	(15.20)	(53.20)	(40.00)	(12.30)	
9.	Operational definition	257 (254.60)	214 (195.90)	46 (53.50)	15 (28.10)	160 (173.70)	125 (133.60)	46 (36.50)	32 (19.10)	64 (52.60)	31 (40.50)	9 (11.10)	6 (5.80)
10.	Formulating Hypothesis	14 (28.10)	28 (55.10)	284 (271.00)	206 (177.90)	31 (19.10)	62 (37.60)	176 (184.90)	94 (121.40)	8 (5.80)	14 (11.40)	52 (56.00)	36 (36.80)
11.	Experimenting	151 (176.60)	298 (269.40)	52 (55.60)	31 (30.70)	146 (120.30)	163 (183.80)	36 (37.90)	18 (20.90)	36 (36.40)	48 (55.70)	17 (11.50)	9 (6.30)
12.	Counting Numbers	264 (263.10)	189 (193.20)	64 (57.70)	15 (18.00)	171 (179.50)	142 (131.80)	36 (39.40)	14 (12.30)	62 (54.40)	34 (40.00)	9 (11.90)	5 (3.70)
13.	Raising Questions	268 (259.90)	181 (187.90)	65 (60.30)	18 (23.80)	165 (177.30)	138 (128.20)	38 (41.20)	22 (16.30)	58 (53.70)	36 (38.90)	11 (12.50)	5 (4.90)
14.	Manipulative Techniques	18 (31.80)	64 (73.60)	246 (234.00)	204 (192.70)	33 (21,70)	58 (50.20)	178 (159.60)	124 (131.50)	9 (6.60)	17 (15.20)	48 (48.40)	36 (39.80)
15.	Building Mental Models	14 (27.50)	28 (25.50)	206 (201.70)	284 (257.30)	32 (18.80)	46 (31.10)	125 (137.60)	160 (175.50)	6 (5.70)	12 (9.40)	50 (41.70)	32 (53.20)
	Cumulative	**81 (108.00)**	**284 (254.10)**	**106 (111.20)**	**61 (58.80)**	**97 (73.70)**	**148 (173.40)**	**76 (75.90)**	**42 (40.10)**	**26 (22.30)**	**48 (52.50)**	**28 (23.00)**	**8 (12.10)**

S/N	ITEM	Df	x^2_{cal}	x^2_{tab}	Remarks
1.	Observing	6	14.11	12.592	NS
2.	Classifying	6	16.45	12.592	NS
3.	Inferring	6	15.13	12.59	NS
4.	Predicting	6	19.13	12.59	NS
5.	Measuring	6	21.73	12.59	NS
6.	Communicating	6	7.68	12.59	S
7.	Controlling variables	6	15.58	12.59	NS
8.	Interpreting data	6	6.02	12.59	S
9.	Operational definition	6	26.65	12.59	NS
10.	Formulating Hypothesis	6	56.99	12.59	NS
11.	Experimenting	6	20.08	12.59	NS
12.	Counting Numbers	6	6.11	12.59	S
13.	Raising Questions	6	6.89	12.59	S
14.	Manipulative Techniques	6	18.38	12.59	NS
15.	Building Mental Models	6	40.02	12.59	NS
	Cumulative	6	**25.28**	**12.59**	NS

Table 3

Chi-square Analysis on the Perceptions of Upper Basic Science Teachers on the Difficulty in Teaching Science Process Skills Based on Teachers' Years of Teaching Experience

Summary of Findings

The finding of this study revealed that upper basic science teachers in Kwara State, Nigeria perceived science process skills difficult and complexity was the reason adduced for perceiving SPS difficult to teach.

Discussion

Findings from the study revealed that the analysis of the results revealed that science process skills were perceived difficult to teach by upper basic science teachers. The perceptions of the teachers also varied due to the low capability to teach science process skills. This shows that upper basic science teachers understand the science process skills and they should not relent on the method used in teaching the skills. This finding is in line with Ogunkola and Samuel (2011) who found that there was no significant difference in the perceptions of difficult science topics based on gender.

Findings reveal that, the most frequent reasons given by upper basic science teachers for perceiving science process skills difficult to teach include: Complexity of science process skills, Abstractness of science process skills, Lack of practical skills. This finding is in agreement with Harlen (1999) who found that at different stages, the challenges of science process skills are due to its complexity in nature, abstractness, minimal attention to practical methods and science teachers' specialization.

Conclusion

From the findings and discussions, the following conclusions were arrived at;

Majority of the upper basic science teachers in Kwara State, Nigeria perceived science process skills difficult to teach.

Complexity, abstractness of SPS and lack of practical skills make it difficult for teachers to teach.

Teachers' perceptions of the difficulty in teaching science process skills were independent of teachers' years of teaching experience.

Reasons adduced for the difficulty in teaching science process skills varied based on experience.

Recommendations

1. Teachers need to pay more attention to difficulty in teaching of science process skills for an in-depth understanding so that teaching Science Process Skills would not remain a herculean task.

2. The upper basic science teachers should be equipped with mental cognitive tools such as study technology so as to enable them to carries out effective teaching of the skill and this could reduce the reasons for perceiving the skills difficult, especially complexity, which has the highest percentage, among others.

3. Upper basic science teachers in Kwara State should strive to update their knowledge of science teaching and improve their pedagogical skills by attending seminars/workshops and in-service training organized by professional bodies.

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