



**TEACHERS' AND STUDENTS' PERCEPTIONS OF FACTORS
INFLUENCING TEACHING AND LEARNING OF CHEMISTRY IN
SENIOR SCHOOLS IN MINNA, NIGERIA**

BY

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Abstract

The present study sought to investigate the perceptions of teachers and students on the factors influencing teaching and learning of chemistry in senior secondary schools in Minna, Niger State, Nigeria. The perceptions of private and public school students and teachers on these factors was critically examined. The study adapted a mixed research (a structured questionnaire for the students and interview items for the teachers). A total of one hundred and fifty six respondents, one hundred and forty four students randomly selected from each of the twelve public schools. Twelve teachers were purposively selected for this study, one from each of the twelve public schools. The quantitative data collected was analyzed using descriptive and inferential statistics. Specifically, frequency and percentages was used to answer research question 1 and 2. The hypotheses was tested using Chi-Square at 0.05 significant levels. Tables were used to answer research question 3 and 4 for qualitative data collected. The result showed that there was a significant difference in the perceptions of male and female students on factors influencing chemistry learning in secondary schools as the chi-square calculated value (171.87) greater than chi-square table value (7.81), There was no difference in public school teachers' perceptions on the factor influencing the teaching of chemistry in



secondary schools as interview responses revealed. However, some suggestions were offered on how to improve on the factors highlighted to make the teaching and learning of chemistry more effective and interesting.

Keywords: Perception, teaching, learning, private school, public school.

Introduction

Science is a systematic and logical approach to discovering how things in the universe work. It is also the body of knowledge accumulated through discoveries about living and non-living things in the universe (Bradford, 2015). The importance of the knowledge of science in the development of any nation cannot be overemphasized and as such science education should be given maximum attention especially in developing country like Nigeria. Science education is the teaching and learning of science to non-scientists, such as school children, college students, or adults within the general public (Science Education Wikipedia, 2013). It is a veritable tool for social change to bring about socio economic development in any nation. The application of the knowledge of science is a tool to solving real life problems and providing enabling environment to face global challenges. Despite the importance of science education, the teaching and learning of science have been confronted with various challenges (Omorogbe & Ewansiha, 2013). One of these challenges is the teacher related factors in terms of presenting science instructions to learners. Science lessons are presented in dogmatic style and thus inhibit meaningful verbal learning which makes students resort to rote memorization of scientific facts and concepts. Students therefore, perceive science as a series of tediously accumulated facts about the world (Sciencelearn.org, 2017).

Chemistry is a branch of physical science which deals with the study of composition, structure, properties, and change of matter. Chemistry has become one of the most important disciplines in the school curriculum; its importance in the general education has gained world-wide recognition. Chemistry subject in secondary school is pivotal to the development of science and technology. In a complex and dynamic society as ours today, chemistry and chemical sciences are very essential. They are pivotal in our day to day lives and are helping the world in order to respond promptly to some of the great challenges faced today. Such challenges include global warming, environmental pollution and degradation, earthquake, energy problems, flooding and chemical weapon devastated areas across the globe (American Chemical Society, 2015).



The perception of teachers to the challenges facing the learning of chemistry by students determines their conduct in the classroom. Nwachukwu (2009) stated that the teachers' way of thinking and beliefs that guide his or her behavior and decisions inside and outside the classroom. Adeyemo (2011) opined that the perception of teachers to a large extent determines the level of understanding attained by their student(s) and is also a tool in predicting students' achievement. Perhaps, teachers' perception of concepts of knowledge and learning are the foundations upon which teaching patterns are built.

Purpose of the Study

The main purpose of this research is to find out the:

1. perception of public school students on the factors influencing the learning of chemistry in senior secondary schools?
2. difference in the perceptions of male and female students on factors influencing the learning of chemistry in senior secondary schools.
3. perception of public school teachers on the factors influencing the teaching of chemistry in senior secondary schools?
4. difference in the perceptions of qualified and unqualified teachers on factors influencing the teaching of chemistry in senior secondary schools.

Research Questions

1. What are the perceptions of public school students on the factors influencing the learning of chemistry in senior secondary schools?
2. Is there any difference in the perceptions of male and female students on the factors influencing the learning of chemistry in senior secondary schools?
3. What are perceptions of public school teachers on the factor influencing the learning of chemistry in senior secondary schools?
4. Is there any difference in the perceptions of qualified and unqualified teachers on the factors influencing the teaching of chemistry in senior secondary schools?

Research Hypotheses

The following hypotheses have been formulated to guide the research study:

H₁: There is no significant difference in the perception of male and female students on factors influencing the learning of chemistry in senior secondary schools.



Result Analysis/Discussion

Table 1 indicated that out of 156 students participated in this study, 54 representing 37.50% are male, and 90 representing 62.50% are female. Also, there 8 male teachers with 66.67%, while their female counterpart is 4 with 33.33%. Hence, majority of the students' respondent are female, while majority of the teachers who participated in this study are male.

Table 1*Demographic Information of Respondents based on Gender*

Gender	Frequency	Percentage	Total
Students			
Male	54	37.50	144
Female	90	62.50	
Teachers			
Male	8	66.67	12
Female	4	33.33	
Total		100	156

Data Analysis

Research Question 1: What are the perceptions of public school students on the factors influencing the learning of chemistry in senior secondary schools?

Table 2*Perceptions of Public School Students on the Factors Influencing the Learning of Chemistry*

S/N	Subject Related Factors	SA	A	D	SD	Mean	SD
1.	The syllabus is too wide.	73	50	9	11	3.29	0.89
2.	The curriculum is unstable.	56	26	19	41	2.68	1.26
3.	Chemistry topics are abstract in nature.	66	43	13	22	3.06	1.08
4.	Inadequate chemistry textbooks.	55	52	13	21	3.00	1.04
5.	Chemistry does not inspire students.	17	29	59	34	2.21	0.95



6. Textbooks do not sufficiently simplify topics.	30	58	18	32	2.62	1.07
Total	297	258	131	161	2.81	1.05
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Students Related Factors	SA	A	D	SD	Mean	SD
7. Students' poor background in science.	59	36	20	27	2.89	1.15
8. The students' future career has no link with the study of chemistry.	15	30	55	44	2.11	0.96
9. Inadequate interest on the part of learners.	22	53	27	39	2.63	2.77
10 Students' poor study habit result to difficulty in understanding chemistry.	69	45	7	23	3.11	1.08
11 Educated parents do not help their children to understand chemistry.	22	28	50	44	2.19	1.04
12 Students' psychological fear of the chemistry as difficult subject poses a problem in learning chemistry.	63	54	13	14	3.15	0.95
Total	250	246	172	191	2.68	1.32
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Teacher Related Factors	SA	A	D	SD	Mean	SD
13 Inability to relate concepts in chemistry to real life situations.	53	48	12	30	2.87	1.13
14 Inability to entertain questions during lesson.	29	49	23	42	2.45	1.12
15 Poor teaching methods adopted by teachers.	31	43	29	39	2.46	1.12
16 Inadequate chemistry teachers in terms of number and quality.	63	44	19	17	3.07	1.03
17 Inadequate assessment on practical lessons.	46	50	19	27	2.81	1.09
18 Inadequate lesson preparation by teachers.	27	40	40	35	2.42	1.06
Total	249	274	142	190	2.68	1.09



School Related Factors	SA	A	D	SD	Mean	SD
19 Noisy environment.	68	38	14	22	3.07	1.10
20 Insufficient instructional materials to teach chemistry.	74	42	14	11	3.27	0.93
21 Inadequate time for chemistry lesson in the timetable.	54	53	14	22	2.97	1.05
22 Absence of equipped library.	54	47	13	26	2.92	1.11
23 Large class size.	65	48	18	9	3.21	0.90
24 Inadequate exposure to practical chemistry.	70	46	6	21	3.15	1.05
25 Ill-equipped chemistry laboratory.	57	54	13	19	3.04	1.01
26 Poor classroom learning environment.	47	29	27	36	2.63	1.20
27 Inadequate incentives for chemistry teachers.	39	64	13	24	2.84	1.02
28 Inadequate laboratory supporting staff.	59	40	21	22	2.96	1.09
29 Inadequate support from school administrators and community.	52	46	18	27	2.86	1.11
Total	324	279	98	149	2.99	1.05

Table 2 shows the perception of public school students on the factors influencing the learning of chemistry in senior secondary schools which were categorized into four sections, namely: Subject Related, Students Related, Teachers Related and School Related. The results indicated that for subject related factors the frequencies of: strongly agree (297) and agree (258) are greater than frequencies of: Disagree (131) and Strongly Disagree (161), also the average of 2.81 is greater than 2.5 benchmark mean. Thus, subject matter related factors, such as: The syllabus is too wide, The curriculum is unstable, Chemistry topics are abstract in nature, Inadequate chemistry textbooks, Chemistry does not inspire students and Textbooks do not sufficiently simplify topics exist in public schools.

Furthermore, for students' related factors, the results showed that the frequencies of: Strongly Agree (250) and Agree (246) are greater than frequencies of: Disagree (172) and Strongly Disagree (190), also the average mean of 2.68 is greater than 2.5 benchmark mean. Thus, students related factors did exist in public schools. Also,



for teachers' related factors, the results showed that the frequencies of: Strongly Agree (249) and Agree (274) are greater than frequencies of: Disagree (142) and Strongly Disagree (190), also the average mean of 2.68 is greater than 2.5 benchmark mean. Thus, teachers related factors existed in public schools. Additionally, schools related factors, the results revealed that the frequencies of: Strongly Agree (324) and Agree (279) are greater than frequencies of: Disagree (98) and Strongly Disagree (149), also the average mean of 2.99 is greater than 2.5 benchmark mean. Hence, schools related factors existed in public schools.

Research Question 2: Is there any difference in the perceptions of male and female students on the factors influencing the learning of chemistry in senior secondary schools?

Table 3

Cross-tabulation Table of Difference in the perceptions of male and female students on the factors influencing the learning of chemistry

Gender	Frequency	SA	A	D	SD	Total
Male	Observed	1417	948	535	417	3317
	Expected	1330.09	970.37	527.94	488.60	3317
Female	Observed	1896	1469	780	800	4945
	Expected	1982.91	1446.63	787.06	728.40	4945
Total	Frequency	3313	2417	1315	1217	8262

Table 3 shows similarity in the perception of students based on gender with observed and expected frequencies of male students: 1417/1330.09 and 948/970.37 for strongly agree and agree respectively greater than their 535/527.94 and 417/488.60 for disagree and strongly disagree respectively, while observed and expected frequencies of female students are: 1896/1982.91 and 1469/1446.63 for strongly agree and agree respectively greater than their 780/787.06 and 800/728.40 for disagree and strongly disagree respectively. Although, they have same perception but females' own is more pronounced with higher total frequency.

H₀₁: There is no significant difference in the perception of male and female students on factors influencing the learning of chemistry in senior secondary schools.

**Table 4***Chi-square Results on factors influencing students' learning of Chemistry based on Gender*

Gender	SAA	DSD	Total	df	Cal Val.	Tab Val.	Remark
Male	1183	476	1659	3	28.04	7.81	Sig.
Female	1683	790	2473				

SAA- Strongly Agree + Agree

DSD- Disagree + Strongly Disagree

Table 4 showed chi-square analysis results which indicates that there was a significant different in the perception of male and female students on factors influencing chemistry learning in senior secondary schools as the chi-square calculated value (28.04) greater than chi-square table value (7.81). This difference implies that female students held that factors listed could influence the learning of chemistry while male students held contrary views.

Research Question 3: What are perceptions of public school teachers on the factor influencing the learning of chemistry in senior secondary schools?

Table 5*Perceptions of Public School Teachers on the Factor Influencing the Teaching of Chemistry*

S/N	Interview Questions	Coded Transcripts	Sub Theme	Main Theme
1	For how long have you been teaching?	1-5yr(1), 6-10yr(2), 16-20yr(5), 21-35yr(4)	Teaching experience	Influencing factor
2	How does teachers' qualification enhance or promote students' understanding of chemistry?	Teachers' qualification enhance effective teaching and learning of chemistry	Teachers' qualification	Influencing factor
3	State the method(s) you commonly use in the teaching of chemistry: Lecture method, drill and practices method, class demonstration	Discussion method, Class demonstration, Practice method, Assignment and group discussion, Drill and Practice method	Teaching methods	Influencing factor



	method, homework assignment method, discussion groups method, practical work/class experiments methods and projects method			
4	How often do you use the method(s) mentioned above	Fortnight, monthly, twice a term	Teaching methods	Influencing factor
5	How many periods are allocated to chemistry in your school timetable per week?	Three periods (90%), Two periods (10%)	Lesson duration	Influencing factor
6	What are the challenges you are having with the periods and time allocated to chemistry lessons?	It is too small to allow coverage of syllabus	Effect of Lesson duration	Influencing factor
7	What do you think could be the reasons why students fail in chemistry test or exams?	Poor reading habit, subject and school related factors	Students' performance	Influencing factor

S/N	Interview Questions	Coded Transcripts	Sub Theme	Main Theme
8	How does parents' educational level influence the students' performance in chemistry?	Provision of adequate learning materials, hire extra lesson teacher, close monitoring of their progress	Parents educational status	Influencing factor
9	How are you treating the weaker learners amongst your students?	Giving special attention during teaching, support and encouraging group work	Teaching methods	Influencing factor



10	How often do you test your students after every topic?	Once	Teaching methods	Influencing factor
11	How often do you conduct practical for your students?	Mostly once in a term	Teaching methods	Influencing factor
12	In terms of apparatus and reagents required for experiments, how equipped is your chemistry laboratory?	Poorly equipped	Learning materials	Influencing factor
13	What can you say about students' response to chemistry lessons in your school?	Satisfactory	Students' interest and attitude	Influencing factor
14	Which effort are you making as a chemistry teacher to increase your students' interest in chemistry lesson?	Use of varieties of teaching methodology and available instructional materials	Teaching methods	Influencing factor
15	How do you rate the attitude of your students toward Chemistry?	Positive	Students' interest and attitude	Influencing factor



S/N	Interview Questions	Coded Transcripts	Sub Theme	Main Theme
16	Can you suggest possible measures which would be taken to improve the performance of Chemistry in your school?	Equipping the laboratory with needed equipment and materials and making it functional, organizing seminars and workshops, employing the qualified personnel, reduce class size, improving students/teachers interpersonal relationship	Suggestions for improving students' performance	Suggestions for improving students' performance
17	How many times in the last 5 years have you attended a seminar, workshop or an in-service course for teaching of Chemistry?	None (98%), Once in a year (2%)	Man power development	Influencing factor
18	What are the challenges you face as a chemistry teacher in your school?	Lack of equipped laboratory, large class size, students' poor study habit, limited allotted time to chemistry on school time table, lack of instructional materials	Teaching/learning challenges	Teaching/learning challenges
19	Suggest some possible solutions to these challenges?	Equipped chemistry laboratory, reduced class size, enhanced students' study habit, more periods be allotted to chemistry on school time table	Solutions to teaching/learning challenges	Solutions to teaching/learning challenges
20	How available are instructional materials	Not adequate (80%), fairly adequate (20%)	Learning materials	Influencing factor



	for teaching chemistry in your school?			
21	How many chemistry students do you have per class in your school?	37 (35%), 85 (55%), 120 (10%)	Class size	Influencing factor

S/N	Interview Questions	Coded Transcripts	Sub Theme	Main Theme
22.	How does number of chemistry students per class possess challenges to effective teaching and learning in your school?	It hinders effective learning, possess challenges to effective classroom management, teacher find it difficult to attend to weaker learners	Class size	Influencing factor

Table 10 presents interview responses of public school teachers' perception on the factors influencing the teaching and learning of chemistry in senior secondary schools. From the table, even with difference in teachers' gender, qualification(s) and years of teaching experience amongst the public school teachers who participated in the study, they all proffer the same solutions to chemistry teaching/learning challenges in public senior secondary schools.

Research Question 4: Is there any difference in the perceptions of qualified and unqualified teachers on the factor influencing the teaching of chemistry in senior secondary schools?

Table 6

Perceptions of Qualified and Unqualified Teachers on the Factors Influencing the Teaching of Chemistry in Senior Secondary Schools

Qualification of Public School Teachers' who Participated

B. Ed Chemistry (Qualified)
B. Ed Chemistry (Qualified)
B. Ed Chemistry (Qualified)
B. Sc Chemistry (Unqualified)
B. Sc Chemistry (Unqualified)
HND Chemistry (Unqualified)
B. Ed Chemistry (Qualified)
B. Ed Chemistry (Qualified)

Summary of identified factors Influencing teaching and learning of chemistry

1) Teaching qualification
2) Teaching methods
3) Lesson duration
4) Teaching experience
5) Man power development
6) Inadequate instructional materials
7) Insufficient number of



B. Sc Chemistry (Unqualified)	periods
B. Sc Chemistry (Unqualified)	8) Students' performance
B. Ed Chemistry (Qualified)	9) Parents' educational
B. Ed Chemistry (Qualified)	status
	10) Learning materials) Large
	class size

Table 6 shows that even with difference in qualification amongst the teachers who participated, there is no difference in the perceptions of qualified and unqualified public school teachers on the factor influencing the teaching of chemistry in senior secondary schools.

Table 7*Coded Interview Transcripts Transformed into Sub-themes and Themes*

S/N	Theme Name	Sub Theme Name	How many participants mentioned it (across all interviews)
1	MAIN THEME 1 Factors influencing teaching and learning of chemistry	SUB THEMES 1 Teaching experience Teaching qualification Teaching methods Lesson duration Students' performance Parents educational status Learning materials Students' interest and attitude Man power development Large class size	11 (91%) 12 (100%) 10 (83.3%) 10 (83.3%) 9 (75%) 10 (83.3%) 12 (100%) 8 (66.67%) 12 (100%) 9 (75%)
2	MAIN THEME 2 Suggestions for improving MAIN THEME 1	SUB THEMES 2 Equipping chemistry laboratory Employing qualified teachers and giving them enabling environment to attend seminars and workshop Allocation of a minimum of five periods per week Reduced class size Improving teacher/student interpersonal relationship	11 (91.67%) 10 (83.3%) 10 (83.3%) 11 (91.67%) 10 (83.3%)



		Use of varieties of teaching methods	11 (91.67%)
3	MAIN THEME 3 Teaching/learning challenges in private and public schools	SUB THEMES 3 Large class size	10 (83.67%)
		Students' poor study habit	12 (100%)
		Insufficient number of periods	12 (100%)
		Lack of instructional materials	9 (75%)
4	MAIN THEME 4 Solutions to teaching/learning challenges	SUB THEMES 4 Equipped chemistry laboratory	10 (83.3%)
		Reduced class size	9 (75%)
		Enhanced students' study habit	12 (100%)
		A minimum of 5 periods per week	10 (83.3%)
		Provision of adequate instructional materials	11 (91.67%)

Total No of participants – 12

Table 7 presents data on distribution of respondents by category of teaching qualifications. The qualification(s) of public school teachers were categorized into two, namely: Qualified and Unqualified. The results indicated that public school teachers who participated in the study, only 4 out of 12 are unqualified. All the teachers, irrespective of their qualification(s) pointed out to the same chemistry teaching/learning challenges in public senior secondary schools. Hence there is no difference in the perceptions of qualified and unqualified teachers on the factors influencing the teaching of chemistry in senior secondary schools.

1. There is no difference in the perceptions of qualified and unqualified private and public school teachers on the factor influencing the teaching of chemistry in senior secondary schools as interview responses revealed.

Discussion

The findings revealed that the perceptions of public school students on the factors influencing the learning of chemistry in senior secondary schools existed in four categories, namely: Subject Related (2.81>2.5), Students Related (2.68>2.5), Teachers Related (2.68>2.5) and School Related (2.86>2.5). This could be as a results of lack of key basic facilities for learning chemistry in public schools which includes the following (Inadequate chemistry textbooks, Chemistry does not inspire students, Textbooks do not sufficiently simplify topics, Students' poor study habit result to difficulty in understanding chemistry, Educated parents do not help their



children to understand chemistry, Students' psychological fear of the chemistry as difficult subject poses a problem in learning chemistry, Inadequate chemistry teachers in terms of number and quality, Inadequate assessment on practical lessons, Inadequate lesson preparation by teachers, Ill-equipped chemistry laboratory, Poor classroom learning environment, Inadequate incentives for chemistry teachers, Inadequate laboratory supporting staff, Inadequate support from school administrators and community). This implies that for students in those schools to advance career in chemistry may either be impossible or only few ones will manage to excel by great efforts and prayers. This is concurrence with many authors that have reported the issue of inadequate science equipment in educational institution. (Ogunmade, 2006; Ugwu 2008; Nwagbo, 2008; Bajah, 1982; Osobonye, 2002).

From Table 4, 5, 6 and 7, it was observe that public school teachers have the same perceptions of factors influencing teaching and learning of chemistry in senior secondary schools in Minna, Niger State, Nigeria. Four themes and four sub-themes were generated from the interview conducted: MAIN THEME 1 (Factors Influencing Teaching and Learning of Chemistry); SUB-THEMES 1 (Teaching experience, Teaching qualification, Teaching methods, Lesson duration, Students' performance, Parents educational status, Learning materials, Students' interest and attitude, Man power development and Class size); MAIN THEME 2 (Suggestion for Improving MAIN THEME 1); SUB-THEMES 2 (Equipping the chemistry laboratory, Employing qualified teachers and creating enabling environment for them to attend seminars and workshops, Allocation of minimum of 5 periods per week, Reduced class size, Improving teacher/student interpersonal relationship and Frequent use of varieties of teaching methods); MAIN THEME 3 (Teaching/Learning Challenges); SUB-THEMES 3 (Large class size, Students' poor study habit, Insufficient number of periods and Lack of instructional materials); MAIN THEME 4 (Solutions to Teaching/Learning Challenges); SUB-THEMES 4 (Equipped chemistry laboratory, Reduced class size, Enhanced students study habit, A minimum of 5 periods per week and Provision of adequate instructional materials).

The findings revealed that majority of respondents mentioned: Teaching experience, Teaching qualification, Teaching methods, Lesson duration, Students' performance, Parents educational status, Learning materials, Students' interest and attitude, Man power development and Large class size as factors influencing teaching and learning of chemistry in senior secondary schools (as shown in table 4, 5, 6 and 7). Additionally, this study revealed that only 2 out of 24 chemistry teachers (10%) from private and public schools in Minna metropolis attended seminars and workshops for at least two times within a period of five years. This



point may be a contributory factor to the poor performance of Chemistry within the metropolis. Teachers attending seminars and workshops frequently was suggested to act as catalysts or boosters for increasing teachers' proficiency. This study is consistent with the findings of Esu (1988) in which an insignificant influence of classroom management technique was recorded between in-service attendants and non-attendant based on lack of experience by one (non-attendant) group. This is also in agreement with the view of Uche (1981) who found out that in-service training, seminars and workshops act as catalysts or boosters for the acquisition of self-mastery in the job being performed.

Furthermore, it was observed that the most common teaching learning methodology employed by the majority of teachers in public secondary schools in Minna are Lecture method, Discussion method, Class demonstration, Practice method, Assignment and group discussion, Drill and Practice method. This is in agreement with the findings of Mills (1991) who said that it is more prudent to employ varieties of teaching methods such as practical approach, class demonstration and field excursions which are more student involving for better academic results to be achieved. Majority of the respondents suggested that the pedagogical aspect of teaching and learning to be considered as the student's attitude towards the subject is influenced by the method the teacher uses in teaching. This is in line with the study conducted by Endurance J, Tamunosis PF (2020) and Woldeamanuel MM, Atagana H, Engida T (2014) in Ethiopia that the students' positive attitude is influenced by the teachers' interest and effectiveness in teaching science.

Conclusion

The study researched teachers' and students' perceptions of factors influencing teaching and learning of chemistry in senior schools in Minna, Nigeria. The study concluded that the perceptions of public school students on the factors influencing the learning of chemistry in senior secondary schools were similar and existed in four categories, namely: Subject Related, Students Related, Teachers Related and School Related. Also, there were significant different in the perception of students on factors influencing chemistry learning in senior secondary schools based on gender. And finally, the teachers in public schools mentioned: Teaching experience, Teaching qualification, Teaching methods, Lesson duration, Students' performance, Parents educational status, Learning materials, Students' interest and attitude, Man power development and Large class size as factors influencing teaching and learning of chemistry in senior secondary schools (as shown in table 4, 5, 6 and 7).



Recommendations

The following recommendations have been made in line with the findings of this study:

1. Government/school administrators should create an enabling environment for teachers to attend seminars/workshops on regular basis in their area of specialization so that they can have knowledge of current ideas and innovations that have taken place in the educational field.
2. As practical is an integral part of the subject. Then there should be well-equipped laboratories with essential amenities like water system, electricity and fire extinguisher, to mention but few.
3. The teachers' academic and professional qualifications should be based on the required discipline, that is, chemistry. Non-chemistry graduates with no education background should not be employed to teach chemistry as this will affect the effectiveness of such teachers as he/she can easily run away from difficult topics.

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