



# The Effect of Science Teachers' Instructional and Methodological Competences on Science Students' Academic Performance in Secondary Schools in Rivers State

**Laura Gbekee Kalagbor**

Department of Educational Management

Faculty of Education

Ignatius Ajuru University of Education, Nigeria

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## Abstract

This study made a theoretical and empirical investigation of the effects of science teacher's instructional and methodological competence on students' academic performance. Descriptive and survey research design was employed in this study. The design for this study followed a logical sequence that connects empirical data to the study's research questions and ultimately to its conclusions using survey designs. An estimate of 25 secondary school teachers and 200 secondary school science students from the selected schools were used. A questionnaire entitled Science Teachers' Instructional and Methodological Competences on Science Students' Academic Performance in Secondary School (STIMCSSAPSS) was used to elicit data from respondents. The instrument was validated by expert in two universities in Rivers state. The reliability of the questionnaire was established using the Pearson product-moment correlation coefficient ( $r$ ) reliability estimate, which yielded a cumulative reliability value of .870. The data collected from the respondents were analyzed using the Statistical Package of the Social Sciences (SPSS) Version 23. Mean, standard deviation and variance was used in analyzing the research questions. The study concluded among others that science teachers' instructional process competences affect students' academic performance and science teachers' methodological competences during instruction advances students' academic performance. The study recommended among others that programs for the education of the nation's science teachers must be viewed by schools as a major responsibility of society and must be adequately supported and promoted and vigorously advanced by schools top leadership.

**Keywords:** Science Teachers, Instructional Competences, Science Students, Academic Performance, Secondary Schools, Rivers State, Nigeria.

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## INTRODUCTION

The issue of poor academic performance of students, particularly in science subjects in Nigeria has been of much concern to parents, teachers, educational planners as well as the government. The problem is so much that it has led to the widely acclaimed fallen standard of education in Nigeria including Rivers State (Ololube, 2009, 2011). The quality of science education depends on the science teachers as reflected in the performance of their duties (Darling–Hammond, 2000; Briggs et al., 2012). Over time, science students' academic performance in both internal and external examinations had been used to determine excellence in science teachers' competence and teaching methodology (Ajao, 2001). The quality of science teachers have been shown to have an important influence on science students' academic performance, and they also play a crucial role in educational attainment because the teacher is ultimately responsible for managing and translating policy into action and principles based on practice during interaction with the students (Afe, 2001). Both the science teaching and learning depend on the science teachers: no wonder an effective science teacher has been conceptualized as one who produces desired results in the course of his duty as a science teacher (Uchefuna, 2001).

Considering government huge investment in public education, its output in terms of quality of students has been observed to be unequal with government expenditure. Consequent upon the observed deterioration in the academic performance, attitude and values of science students in public secondary schools, one wonders if the high failure rates and the poor quality of the science students is not a reflection of the instructional quality of the science teachers in the schools (Barnett, Matthews, & Jackson, 2003). In other words, the ineffectiveness of teachers in classroom interaction with the students could be responsible for the observed poor performance of students and the widely acclaimed fallen standard of science education in Nigeria.

In Nigeria, public discussions are frequently focused on educational standards (Ijaiya, 1998). The unhappiness of the general public mentioned earlier, becomes more prominent following the annual release of the West African Senior School Certificate Examination results, which confirm that student outcomes do not match government and parental investment. Stakeholders (e.g., government, teachers, parents, education planners, curriculum developers etc.) are concerned that the system is turning out graduates with poor results. To them, it is questionable whether or not teachers in the public secondary schools who are the most important factor in the effectiveness of schools and in the quality of a child's education are competent to teach effectively. The National Policy of Education states, "no education system can rise above the quality of its teachers" (FRN, 2014, p. 39). Ogunsaju (2004) stated that the academic standard in all Nigerian educational institutions has fallen considerably below societal expectations. Blumende (2001) corroborated this view when he reported that the decline in the quality of science education cannot be ignored by anyone who is aware of the significant roles of science education as an instrument of societal transformation, technology and development.

There is a need to focus on science teachers' adequacy and competence in respect to their pedagogical practices and strategies, on one hand, and mastery of the curriculum and subject content, on the other (Stuart, 2004; Rodgers, 2001). In support of the aforementioned scholars, Ekwesili (2006) institutionalized the Private Public Partnership (PPP) and School Based Management Committee (SBMC) to manage secondary education and to promote school effectiveness, since students' success depends on the amount of learning that takes place in the classroom and other related 'how effective and efficient the teacher performs in schools'. Ijaiya

(1998) concurs and added that improving the quality of the teaching force in schools could be the key to raising student performance.

Science academic performance could be defined as the display of knowledge attained or skills developed in school science subjects designated by test and examination scores or marks assigned by the subject teachers (Ololube, 2006a). It could also be said to be any expression used to represent students' scholastic standing. Many researchers, psychologists and educators alike, have identified some of the variables that have effects on students' academic performances. In the contexts of this work, science students academic performance is individual student's inherent potentials in terms of intelligence combined with other sociological factors. Ojerinde (1981) in his study identified personality factors such as anxiety, achievement, motivation and level of interest as factors that affected academic performance. The consistency of these claims was asserted by Ford (1985), who said that students with high self-efficacy received higher grades than those with low self-efficacy, and that students with negative self-concept had poor academic performance.

Science teacher variables are also noted to have effect on science students' academic performances. These includes, teachers' knowledge of subject matter, teaching skills, attitude in the classroom, their qualifications and teaching experiences (Ololube, 2009). The quality of teachers' instructional competence is a central theme in an educational system. Science teachers' instructional competence is increasingly judged by focusing on their students' performance, what students actually learn, and how well they learn it. A number of studies have been conducted with the purpose of understanding how quality in education is achieved. Olaleye (2011) conducted a study that considered factors affecting pupil performance and investigated the variables of teacher, student, parents and the community, and concluded that teacher are the key factor in students' academic performances.

In terms of teachers' instructional competences, researchers have argued that competence is a function of teacher qualifications (Aghenta, 2001; Ololube, 2006b, 2009), which suggests that the extent to which a teacher could be competent in teaching seems to depend largely on the teacher's qualification. This contention is supported by Aladejana (2000) argument that the level of a teacher's subject matter competence is a prime predictor of students' learning. However, Aladejana further argued that it is not only the qualifications obtained by a teacher that could contribute to a teacher's quality, but also his or her actual achievement in terms of subject-matter competence.

The length of teaching experience of a teacher has been an important factor determining how effective teachers' instructional competence is to students' academic performance. The importance of experienced teachers in schools has been highlighted by many researchers who have given different opinions about teaching experience as a factor in students' learning outcomes in schools (Akinleye, 2001; Commeyras, 2003). The arguments are based on the fact that experience improves teaching skills (Akinleye, 2001), while students learn better at the hands of teachers who have taught them continuously over a period of years (Commeyras, 2003).

Teachers' integrity seems to be another variable of teacher instructional competence in the school system (Chandon, 2000). Academic integrity has been defined as the dignity which an individual exhibits in the pursuit of academic knowledge (McCabe, 2001). Others have described it as the prestige of oneself in his or her educational endeavours (Glasner, 2002; Obi, 2004). As such, how a teacher conducts himself or herself effectively in a school system is a function of his or her integrity (Uyo, 2004).

In the same vein, teachers' job performance is another variable that could determine a teacher's instructional competence (Ololube, 2006a). It refers to the actions of the teacher in performing certain jobs or duties in the school (Ololube, 2009). It is the totality of the input of the teacher towards the attainment of educational objectives (Ajayi, 2005; Olorunsola, 2010). Teacher's competence is seen in the act of accomplishing a given task in a school organization. It could be measured through the level of in subject matter, lesson note preparation, content covered, level of coverage of scheme of work, lesson presentation, monitoring of pupils work, effective supervision, effective leadership and the disciplinary ability of the teacher (Aghenta, 2000; Glover, Ronning & Bruning, 1990). Thus, in Omotere (2013), teachers' instructional competence has a strong and positive relationship with students' ratings of their overall school satisfaction, students' self-esteem, and academic performance. Teacher's competence enhances a teacher's ability to create an environment that is fair, understanding, and accepting diverse students' ideas, experiences, and backgrounds. Teachers have been found to be one of the most important factors influencing student achievement (Ehindero & Ajibade, 2000; Uche & Umoren, 1998). However, this study focused on two factors that may or may not influence science teacher's teaching competence in a classroom situation:

In all, competence is usually associated with high professional performance, and there is a direct link in the field of education between a teacher's instructional competence and student academic performance (Ololube, 2009; Ekwueme & Igwe, 2010). There are two distinct meanings of "competence" in education. From a theoretical point of view, competence is understood as a cognitive structure that facilitates specified behaviours (Kautto-Koivula, 1993; 1996). From an operational point of view, competence seems to cover a broad range of higher-order skills and behaviours that represent the ability to deal with complex, unpredictable situations (Dunkin, 1997).

## **Problem Statement**

Science has been regarded as the bedrock on which modern day technological breakthrough is built. Nowadays, countries all over the world, especially the developing ones like Nigeria, are striving hard to develop technologically and scientifically, since the world is turning scientific and all proper functioning of lives depend greatly on science. Science is a dynamic human activity concerned with understanding the workings of our world. This understanding helps man to know more about the universe. Without the applications of science, it would have been difficult for man to explore the other planets of the universe.

Science comprises the subject disciplines of physics, chemistry, mathematics and biology amongst others. Many investigations have shown that secondary school students exhibit dwindling interests in science subjects. Among the physical sciences, physics has been rated as one of the most difficult subjects in the school curriculum. Studies have revealed that the performance of Nigerian students in Ordinary Level physics has been generally and consistently poor over the years.

Poor academic achievement in science could be attributed to many factors including teacher's instructional and methodological competence. This implies that the mastery of science concepts might not be fully achieved without the use of appropriate methods. The teaching of chemistry, for example, without appropriate instructional materials may certainly result in poor science students' academic achievement. stress that a professionally qualified science teacher,

no matter how well trained, would be unable to put his ideas into practice if the school setting lacks the equipment and materials necessary for him or her to demonstrate the competence.

### **Purpose of the Study**

The purpose of the study was to examine the effects of science teacher's instructional and methodological competences on science students' academic performance. This purpose shall be pursued through in the following specific objectives:

- Explore how science teachers' instructional process competences vis-à-vis interaction processes during instruction affects students' academic performance.
- Investigate science teachers' methodological competences during instruction and their role in improving students' academic performance.

### **Research Questions**

Two research questions guided this study:

- How does science teachers' instructional process competences affect students' academic performance?
- How does science teachers' methodological competences during instruction advance students' academic performance?

## **REVIEW OF RELATED LITERATURE**

### **Theoretical Framework**

The theoretical framework of this study is grounded in the Functionalist and Bernstein Theory of Pedagogic Discourse of education. Functionalism (Parson, 1959), is the oldest, and still the most dominant, theoretical perspective in sociology and many other social sciences such as education, while Bernstein Theory of Pedagogic Discourse created insights necessary for gaining deeper understanding of how teachers interpret and practice pedagogic activities.

Functionalism is built upon two emphases, namely, the application of the scientific method to the objective social world, and the use of an analogy between the individual 'organism' and 'society'. This study presumes a functionalist view of 'society' specific to the middle years of the twentieth century, which according to Ololube (2006a, 2009) is a time characterized by a high degree of occupational specialization, shared norms and values, stability, and the tendency to maintain equilibrium in the presence of social changes.

Ololube (2011) feels that schools are there to teach children. Schools are set up so that everyone is the same and needed to be taught at school rather than in the home because there is too much bending of the rules at home whereas school is a colder environment. During teaching, the schools are also teaching children that they must become part of society and have ties to society or the child and society will break down. Ololube concludes that quality education is the most important things that schooling can give to children, a sense of belonging to a larger society.

In Leone's (2009) opinion, a school's main function is to socialize children by using the idea of commitment, which is of two types: commitment to the implementation of the broad values of society and commitment to the performance of a specific type of role within the social structure. Presenting the functions of education from the sociological aspect, Carr and Kemmis (1986) draw attention to the fact that the principal functional requirements of education are first, to socialize the young into prevailing norms and attitudes so as to preserve social stability, and secondly, to stratify individuals in accordance with the complex network of roles that sustains the existing social order. While the critical idea here is that school does not operate in isolation, and its function in society is imperative to the development of the society, D'Aeth (1975, p. 32) observed that the central objective of education is to raise the level of skills, especially technical and management skills, needed to support economic growth and to provide an adequate supply of the whole range of professional expertise needed to run a modern nation, and to improve professional development.

Basic to this perspective is the conviction that the regular patterns displayed in human action are caused by social laws operating to ensure the order and cohesion necessary for the preservation of society (Ololube, 2006a). Society is, therefore, according to Ololube (2009) regarded as an interdependent entity maintained through impersonal law-like processes that operate without the intervention of human purpose. Particular institutions, such as education, are presumed to be 'functional' in the sense that they exist in order to serve some of the functions that must be fulfilled for society to survive (Carr & Kemmis, 1986; Ololube, 2009). Carr and Kemmis (1986) and Ololube (2009) further argue that the functionalist sociology of education provides knowledge of how the social mechanism already operating in educational institutions could be modified so that the equilibrium of society could be maintained.

The functionalist approach to education will be adopted in this study because it views the school as a unified purposeful organization or simply as a system that is made up of component parts. The entire staff in the school system is viewed as a whole and they are supposed to be experts in their field. Thus, a clear picture of this 'classic' view of 'professionalism' is the first step toward understanding the contemporary meaning of professionalism for today's education and practical issues. Therefore, the researcher concludes that functionalism as a school of thought focuses on what makes society function and determines its use and purpose. However, given that different situations may influence instructional processes of students and the society at large, Eraut (1994) argues that most accounts of the ideology of professionalism in teaching follow the functionalist models developed by Merton (1960), which accord primacy of place to the professional knowledge base. The problem, to which the concept of a profession is said to provide an answer, is that of the social control of expertise. Experts (teachers) are needed to provide services which the recipients (students) are not adequately knowledgeable to evaluate. Hence the basis for which emphasis is put by the professions on moral probity, service orientation and codes of conduct. Equally, Leino (1996) systematically argues that teachers' professional qualifications should be designed to indicate that aspiring professionals have completed their pre-service education and training and to continuously sustain their competence of qualification and competence in different ways during their practice years. It is in this same perspective that the concept of qualifications and competences form a complementary pair, describing both the knowledge of and ability to perform instructional task (Ololube, 2009).

Thus, the application of the functionalist approach to this study is considered vital because it will offer the opportunity to first, define problems in systematic and functional terms; second, view problems as always interrelated, thereby lending its application to other

components in humanity. And third, the interdependence of the other components of education and society is given consideration. Mainly, the purpose of this choice is not to test or refute functionalist theory, but to use it to select variables of interest and to organize this research in a systematic manner. An examination of the concepts used in this work fits into this framework since a picture of the typical outlook of professionalism is the first step towards accepting the contemporary meaning of professionalism for today's teaching and practice issues (Ololube, 2006a). In essence, the goal is to test how academic and professional qualification of teachers can influence the degree to which teachers fulfill their instructional tasks.

### **Instructional Competence and Students' Academic Performance in Science**

There are different levels of classroom instructional competence that teachers should possess in order to create an effective school.

### **Instructional Process and Science Students Academic Performance**

The reasons that make teachers apply or use the most effective instructional method to achieve teaching objective is a critical aspect of secondary school and students' academic performance. Teaching is viewed to mean a social action because teachers in the classroom interact with their students in such a way that make them to attain the specific pre-determined goals of teaching (Ololube, 2009). As a result teaching can be seen as a diverse and complex activity because the goal of any teaching task is achievement. Therefore, all the interrelated actions of the teacher at any given moment in the classroom must lead to students' academic achievement.

We always hear and talk about gifted teachers and gifted classrooms. The question remains that 'what makes a teacher gifted'? And 'what makes their classrooms special'? 'Do they have certain inherent abilities or qualities that make their classrooms more successful than others'? Or 'do they use techniques that make learning more interesting and permanent for their students'. Getting qualified personnel to provide the instructional services necessary for the achievement of the goals of the teaching is imperative because the goals of any school are to provide society with the right kind of manpower for development and to enhance the quality of living (Ololube, 2009).

The traits of devotion to duty, love of children and the desire to always improve on past effectiveness as well as proper presentation and the creation of successful learning environment are all part of science teachers instructional competence. Gbamanja (1989) in Ololube (2006a) further argued that these characteristics or qualification would equip the teacher to be committed to the science teaching profession and be able to do the following:

- The teachers will believe in their programs and have the initiative to carry them out.
- They will be willing to dedicate themselves to their jobs and render services efficiently.
- They will become persons of perseverance since success cannot be attained overnight.
- They will have faith in their work and possess the enthusiasm and courage to continue even though at times things do not appear the brightest (Lloyd, 1980)

A competent science teacher should be able to possess these skills:

- Subject application;

- Classroom methodology;
- Class management,
- Assessment and recording;
- Understanding the wider role

## **Science Teaching Methods and Students Performance**

Science teaching methodology refers to the process of teaching and learning of science, which brings the learner into relationship with the skills and knowledge that are specified and contained within the curriculum (Ololube, 2006a, 2009). According to Gutek (1988), methods are the means or procedures that a teacher uses to aid students in having an experience, mastering a skill or process, or acquiring knowledge. If efficient and effective, methods of instruction will achieve the desired end because teaching implies the use of a technique or method of instruction to secure a desired objective. Gutek further observed that educators at all levels of instruction are involved in methodological questions. That is why in programmes of teacher education for instance, attention is given to courses in techniques and methods of teaching (e.g., mastering learning method, lecture method, demonstration method, dramatizing and discussion method, questioning method etc.) because through these methods teachers can acquire the competencies needed to carry out instructional processes effectively.

Correspondingly, Colman (in Hanushek, 2003) and Ololube (2005) defined method as an well-ordered system by which a science teacher presents his or her teaching to produce certain changes or results in students. As a result, Colman acknowledged five essential elements of science instructional methodology that can assist students' academic performance:

- The specific objective or purpose of instruction;
- An introduction that relates the particular lesson to previous learning or experience;
- Content or that which is the substance or the subject of a lesson;
- A summary to reinforce the particular learning or experience; and
- An evaluation that determines if the learner has achieved the particular aim.

## **Methods of Teaching**

Four of the common methods of teaching are briefly explained below:

### **Lecture method**

The talk and chalk/marker method, which is also known as (the lecture method) is the traditional method of teaching, which many modern educators consider out-dated. Nonetheless, it is still prevalent in the educational system in many parts of Africa and is probably the most commonly used teaching method in American college classrooms as well (McKeachie, 1999). The talk and chalk/marker method is widely used particularly in Nigerian upper secondary school level. The lecture method is seen as a method that fosters easy coverage of the school syllabus (Gbamanja, 1989). The advantages of this method are that large amounts of material can be covered with a large class size in a single period. The lecture method can communicate the intrinsic interest of the subject matter. The teacher can convey personal enthusiasm in a way that no book or other media can. This enthusiasm stimulates interest, and interested people tend to learn more. Thus,



this method could be used effectively when the teacher introduces a new topic (Ololube, 2006a, 2009).

### **Demonstration method**

The demonstration method of teaching means teaching by displaying an instruction situation with an audio-visual explanation of an idea, process or product. It involves showing and telling the students the point of emphasis. It is mostly used as a technique within a method of teaching, but is sometimes used as a method itself. In his methods of teaching, Gbamanja (1989) describes the demonstration method of teaching as a technique within a method used in order to assist students discover the concept of metal; that is, the teacher needs to demonstrate the physical and chemical properties of several different metals. In addition, in the laboratory for example, the teacher needs to demonstrate the use of a microscope to the class before letting the students use it to discover things themselves. When a science teacher shows the action of carbon dioxide on a piece of moist blue litmus paper, he or she is presenting a demonstration. Likewise a teacher may demonstrate the dissection of a toad or of a rabbit to the students in the laboratory or classroom before students do it themselves (Ololube, 2006a).

Laboratory work is an essential ingredient of science courses, and some component of this is generally preserved even though the amount may fall. In addition to the experience of laboratory work, students have a lot of their contact with teachers in the laboratory setting, and compensation for this may be needed if laboratory time is significantly reduced (Forster, Hounsell & Thompson, 1995).

### **Dramatizing and Discussion Method**

Dramatizing and discussing are two related types of active learning experiences with wide applicability in modern day schooling. Many of the varied forms of both general types have similar basic purposes and values in instructional situations. Indeed there are occasions when either dramatizing or discussing may be chosen as the creative vehicle for achieving specific classroom goals (Ololube, 2006b). Discussion on the other hand, is a situation where two or more people interact verbally with each other. It can be adopted deliberately in a learning situation. However, it sometimes occurs spontaneously as a teacher uses another method of teaching. It can also be considered as a technique of teaching within a method and sometimes occurs for brief intervals during an informal lecture. It is considered student-centered teaching. Stones (2012) see the discussion method as naturally inspired or flowing from dramatization. Often, both categories of activities are employed in association.

### **Questioning Method**

Questioning method is actually more of a technique than a method of teaching. It can be used within various methods of science teaching. Science education goals and methodologies are changing today from the mere acquisition of facts and information to the development of reflective thinking and the intelligent manipulation of materials. According to Reid, Hopkins and Holly (1987) and Gbamanja (1989) in Ololube (2009), questioning is a technique used to sensitize an inquisitive mind and to ascertain if learning objectives can be attained. By so doing, science teachers can develop more ownership of the class. Sensitizing somebody else's mind

requires listening and insightful questioning; in other words it requires the art of being a good conversationalist. A good inquiry-oriented science teacher is an excellent conversationalist. He or she listens well and asks appropriate questions that will assist science students in organizing their thoughts and gaining insight into what is being taught. An inquiry-oriented science teacher seldom tells but often questions. When questioning is handled well, it leads to student centered teaching, which is a fundamental requirement in modern instruction.

## **METHODOLOGY/PROCEDURE**

A descriptive and survey research design was used in carrying out this study. The design for this study followed a logical sequence that connects empirical data to the study's research questions, and ultimately to its conclusions using survey design.

The proposed population for this study consisted of all public senior secondary school teachers and students in Rivers State. The target population for the study consisted of all the public senior secondary school teachers and students in Rivers State, from which a sample was drawn from science teachers and science students in Rivers State.

A sample of 100 secondary school science teachers and 200 science students constituted from the population, using six senior secondary schools in six local government areas out of the present 23 LGAs in Rivers State. Thus, an estimate of 25 secondary school teachers and 200 public senior secondary school science students from the selected schools were used. This number was a convenient number within the time of the research. The stratified/purposive sampling technique was used for the study. This study was restricted to the categories of Senior Secondary School (SSS) students who offer science subjects and teachers who teach science subjects (e.g., physics, chemistry, biology, mathematics, agricultural science and computer technology).

A questionnaire entitled 'Science Teachers' Instructional and methodological Competences on Science Students' Academic Performance in Secondary School' (STICMSSAPSS). In order to decipher the relevant information, a questionnaire designed along 5-point Likert type scale, namely 5 for Totally Agree, TA; 4 for Agree, A; 3 for Not sure, NS; 2 for Disagree, D, and 1 for Totally Disagree, TD, was administered to the above-mentioned groups. The questionnaire will be divided into two sections: Section 'A' dealt with issues of respondents' personal data (gender, age, marital status, level of education, status of respondents, and state of origin). Section 'B' was designed to elicit information on variables that may or not be responsible for science teachers' instructional competence and its relationship to secondary school science students' performance in Rivers State of Nigeria. This section of the questionnaire comprised 14 items on issues of science teacher's instructional process competences *vis-à-vis* instructional and methodological (teaching aid) competences.

For the instrument to be made valid, the researcher took time to comply with the formalities and procedures adopted in framing a research questionnaire (Nworgu, 1991). Secondly, the face and the content validity of the research instrument (questionnaire) was determined by researcher experts from two universities and their inputs helped to restructure a number of items in the questionnaire.

The instrument was tested for reliability using the test-retest method by administering the questionnaire to a sample outside the real population of the study. The reliability of the questionnaire was established using the Pearson product-moment correlation coefficient ( $r$ ) reliability estimate, which gave a cumulative reliability value of .870.

The researcher personally administered the questionnaire in the selected secondary schools in Rivers State, together with two trained research assistants. The data collected from the respondents was analyzed through Statistical Package of the Social Sciences (SPSS) Version 23. Mean standard deviation and variance was used to determine the strength of some variables to the weakness of others.

## RESULT

**Research Question 1:** How does science teachers’ instructional process competences affect science students’ academic performance?

The first research question is “Do science teachers’ instructional process competences affect students’ academic performance?”? The idea here is to examine the connection between teachers’ instructional process and their input towards students’ academic performance as well as determine teachers’ expectation as to what constitutes effective instructional process. To this end, responses on the competency statement items 1-8 of the research instrument (questionnaire) were also tallied along “agree and disagree” to answer this question using mean, standard deviation and variance (see tables 1). It is evident from the result that the respondents have positive attitudes towards professional competences with particular reference to how teachers apply various instructional techniques to achieve instructional objectives.

Table 1: Response on Whether Instructional Processes Competences on Students’ Academic Performance

<i>Competencies (Variables)</i>		<i>Science Teachers</i>			<i>Science Students</i>		
		Mean	SD	Variance	Mean	SD	Variance
1	Science teachers interact with their students respectfully	3.66	.50	.25	2.55	.55	.29
2	Science teachers effectively use questing method as a medium of classroom interaction	3.70	.46	.22	2.91	.53	.32
3	Science teachers effectively manage and arrange classroom to enhance interaction	3.68	.47	.22	2.81	.58	.32
4	Science teachers are approachable in times of difficulties by students	3.74	.46	.21	2.87	.61	.21
5	When interaction between students and science teachers are cordial, it promotes meaningful communication	3.72	.46	.21	2.63	.53	.31
6	Interaction between students and science teachers provides feedback and promotes reflections	3.73	.44	.20	2.65	.60	.30
7	Effective science teachers and students interaction build on learner contributions	3.67	.53	.28	2.91	.52	.28
8	Effective science teachers and students interaction increases interest and devotion to teaching and learning	3.73	.44	.20	2.95	.60	.30
<b>Total</b>		<b>3.70</b>	<b>.47</b>	<b>.22</b>	<b>2.78</b>	<b>.56</b>	<b>.29</b>

**Research Question 2:** How does science teachers’ methodological competences during instruction advance students’ academic performance?

The second research question states, “How does science teachers’ methodological competences during instruction advance students’ academic performance?” This research question is intended at discovering from the respondents’ view if differences exist in the methodological competencies of science teachers influence science students academic performance (items 9-14) (see tables 2). It is evident from the result that the respondents agreed and have positive attitudes towards science teachers’ methodological competences with particular reference to how teachers apply various instructional methods to achieve instructional goals.

Table 42: Means, standard deviation and variance of differences of methodological competencies of science teachers and science students’ academic performance

<i>Competencies (Variables)</i>		<i>Science Teachers</i>		<i>Science Students</i>	
		Mean	SD	Mean	SD
9	Science teachers apply the use of problem-solving methods effectively	3.75	.54	2.67	.85
10	Science teachers adopt the use of individual teaching method effectively	3.46	.56	2.75	.75
11	Science teachers dramatize (Demonstrates) teaching situation effectively	3.67	.73	2.84	.73
12	Science teachers involves the task of assisting students in making worthwhile and satisfying adjustments to school work	3.65	.54	2.57	.85
13	Science teachers match curricular offering with levels of mental development	3.51	.56	2.75	.75
14	Science teachers’ methodological competence increases students’ interest and devotion to teaching and learning.	3.41	.62	2.84	.73
<b>Total</b>		<b>3.57</b>	<b>.59</b>	<b>2.74</b>	<b>.78</b>

## DISCUSSION

### Science teachers’ instructional process competences affect students’ academic performance

According to Creemers (1994, p. 18), instructional effectiveness and research on teaching show that the important conditions for effective teaching include direct instruction (i.e., a conglomerate of factors such as reinforcement, highly structured learning tasks and frequent monitoring of students’ progress), time of task (including homework assignments) and opportunity to learn (i.e., closeness of achievement measurement and content covered). However, Fraser et al. (1987) in Ololube (2011) argued that it is the amount of instruction enhanced by using school days more effectively or increasing homework which particularly leads to improvement in students’ outcomes. Creemers (1994) added that successful methods of instruction which lead to greater student achievement are mastery learning with an emphasis on reinforcement and feedback, co-operative learning, personalized and adaptive instruction, the use of advance organizers, high teacher expectations, longer wait time and good questioning techniques.

Changes brought about in science and technologies have influenced the context of education. Therefore, instructional processes should witness the same turn around in order to meet these compact challenges. Correspondingly, Ruohotie and Grimmett (1996) in Ololube (2011) stated that the environmental changes, rapidly developing technology, the restructuring of education and the demographic flux in the work force has called for increased professional

competence. The lack of the use of professional teachers in teaching and learning processes in Nigeria has undermined the developmental processes of the child and his or her academic achievement. In fact, the unbalanced system of education in Nigeria has resulted in low morale among teachers as well as difficulty in recruiting qualified teaching staffs to carry out instruction in schools, and the mass movement of professional teachers out of the educational system. These problems show us that it is time to be worried about the current state of Nigerian education as well as its future.

Yet, even as the schools struggle to recruit quality teachers, the expectations of those teachers continue to rise. They need to be experts in one or more specific subjects, and this demands an increasing level of professional qualifications. To be able to move ahead with these inherent challenges they must continually update their expertise and knowledge. In order to provide tomorrow's world with the knowledge and skills on which economic and social progress so critically depend, educational institutions and teachers need to respond by developing and delivering appropriate educational content. Moreover, teachers' subject-matter expertise must be complemented with pedagogical competence with a focus on the transmission of a range of high-level skills, including the motivation to learn, creativity and co-operation. This is because technology is becoming a new feature of professionalism in teaching, requiring an understanding of its pedagogical potential and the ability to integrate it into the teaching and learning processes. Finally, professionalism in teaching can no longer be regarded as an individual competence but must include the ability to function as part of a "learning organization" and the capacity to move in and out of other careers and experiences that can enrich teaching ability (OECD 2005).

Furthermore, we hear and talk about gifted teachers and gifted classrooms. What makes a teacher gifted? Moreover, what makes their classrooms special? Do they have certain inherent abilities, qualities that make their classrooms more successful than others? Alternatively, do they use techniques that make learning more interesting and permanent for their students? It leaves us asking, "Can teachers be trained to provide an enriched environment and teach a curriculum in such a way that every child is challenged to perform far above grade level?" Surely, training will introduce them to some of these instructional methods (Miranda & Landmann 2001). There is an outstanding argument here; it puts forward clearly the need for professionally competent science teachers to handle instructional processes, which is a very significant attempt to improve the quality of teaching. However, while we do not undermine the input of gifted teachers in educational development, we recognize that their inputs are limited.

### **Science teachers' methodological competences during instruction advance students' academic performance**

The table 4.2 reveals that the cumulative mean and standard deviation scores for the science teachers ( $M= 3.57$ ,  $SD= 0.59$ ) are higher than those of the science students ( $M= 2.74$ ,  $SD= 0.78$ ). This shows that there are significant relationship in the effectiveness of science teachers methods of teaching and students' academic performance in the area of methodological competencies. The findings likewise revealed practical evidences that science teachers tend to apply correct teaching methods in the teaching and learning process. This lends sufficient support to Janneck and Bleek's argument that current work practices in the education industry are characterized by a strong emphasis on comparative work in small multidisciplinary teams. At the same time, special knowledge or "professional competence" becomes obsolete more rapidly and the ability to acquire the skills relevant for teaching "just in time" grows in importance.

Therefore, social and methodological competences gain importance just as professional competences. Obviously, those competences cannot be learned individually in lectures or traditional seminars, but require “teaching practice” and being engaged in a real-world context. This problem is addressed by offering educational projects to our student teachers with a didactic concept that focuses on authentic teaching practice. These cooperative projects allow them to acquire the aforementioned three key competences in an integrative manner (Janneck & Bleek, 2004).

The evidence from these results makes us believe that there is a relationship between “teaching practices” and “methodological competence” since methodological competence produces facts as input to instructional process and instructional process establishes requirements to stimulate rational input in student’s academic achievements. Teaching practice and method courses given to student teachers at the faculty of education of a university or teacher education institute assist student teachers in gaining relevant methodological skills that aid teaching and learning, which could result in effective schooling. The analysis also reveals that student teachers should focus on educational measurement and evaluation, psychology of education, philosophy of education, sociology of education, educational management, educational planning and other education courses that will expose them to the rudiments of being an effective teacher because methodological competence is very much associated with rigor. This also gives backing to Law and Clover (2000) when they wrote that in the current changing environment of the educational system, professional competence is called for in promoting educational development.

From the preceding discussion, the findings have shown that there are multifaceted roles that teachers play in effecting quality in teaching. The information contained in the data shows that there are no differences in the way science teachers influence science students academic performance in their roles in the instructional process. Also, it is suggested that much importance should be attached to developing trained teachers in the process of teacher training because quality teaching scored high in the evaluation of effective teaching. This lends support to the works of Darling-Hammond (2000) and Scheerens (2000).

## **CONCLUSION AND RECOMNDATIONS**

This research has outlined science teachers’ complex role and explicitly stated the significance of the need for students’ academic performance. The joy and enthusiasm observed in this study led the researcher to think that using professionally competent teachers in the teaching and learning process may be a very good course of action, not only because the science students enjoy the instructional activities, but because they are valuable factors that will enhance the intellectual growth of both the science teachers and the students. The study concluded among others that science teachers’ instructional process competences affect students’ academic performance and science teachers’ methodological competences during instruction advances students’ academic performance. The study recommended among others that programs for the education of the nation’s science teachers must be viewed by schools as a major responsibility of society and must be adequately supported and promoted and vigorously advanced by schools top leadership

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