

# Demand and Supply: A Determinant for Availability of Secondary School Science Teachers in oyo State, Nigeria

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**ABSTRACT:** *The study investigated and ascertained the factors responsible for the science teacher shortage in most of the public secondary schools in the State. This study adopted the descriptive survey research design. The population for the study comprised 629 public secondary schools and 1130 science subjects teachers in public secondary schools in Oyo State. The sample for the study consisted of 75 secondary schools and 225 science teachers using a multi-stage sampling procedure for selection. Data were collected using an instrument titled “Determinants of Demand and Supply of Science Teachers Questionnaire” (DDSSTQ). Percentage scores and standard deviation were used to analyse the data gathered. The results showed that the available science teachers in the sampled schools were 225 while the number of expected science teachers that would meet up with the student’s teacher ratio of 35:1 is 349. The result further showed that there was a shortage of 123 science teachers. Findings showed that the transfer of science teachers without replacement was a major factor affecting the rural public schools in the state, while an increase in student enrolment stands as the major factor of science teachers’ shortage in the urban areas of the State among others. It was therefore recommended that government policies on transfer, leaves, and resignation of the teacher should be modified to allow immediate and prompt replacement.*

**Keywords:** Demand; Supply; Science Teachers; Public Secondary School; Oyo State

## I. Introduction

Science has played significant roles in the development of many nations. It has been observed that science is the bedrock for a nation’s technological advancement and the gateway to the development of any nation. Science which begot technology has helped in providing solutions to numerous human problems. By the beginning of the twentieth century, science as revolutionised the world, for instance, the trend in communication has made it possible to travel faster and to communicate quickly and be alert to the developments happening in other countries and regions than before in the past. Also, science and technology developments have provided new medicines and procedures to improve health and save people’s lives from deadly diseases like Cancer, and Corona Virus, while new technologies in areas like information technology, space science, automobile, biotechnology, agriculture, transportation and nuclear energy which help in the production of nuclear bomb have offer unprecedented opportunities for multifaceted development. Indeed, science is seen as the only guarantee and assurance that got any nation to attain any reasonable level of self reliance and national security. It is the adoption of science in the national life that makes the difference between the developed and the developing countries of the world as noted above. In essence the main cause of competitive gap between Nigeria and the developed countries of the world is the creation and application of scientific knowledge. Many of the developed countries were able to achieve so much in science and technology because of science education. Years back, India was a key member of the club of backward economy, but today the story has changed. India’s

transformation did not happen by accident; rather, it is the result of that country's vision on science education as a gateway to the development of its human capital. India is doing very well in the medical field as well; all due to the country's commitment to science.

Furthermore, countries like the United Kingdom and France benefited immensely from the Industrial Revolution of the 19th century due to their commitment to science education in their school. The United State of America emerged from an agrarian economy into an industrial superpower in the 20th century through the effective application of science education. Education is the foundation for a nation development, countries which are causing waves in technological world such as China, United State of America, Japan, Malaysia, United Arab Emirate, India, Germany, France, Singapore, and Canada are the ones who invested adequately on science education, and the science teachers who are to teach science subjects at the secondary school level, and this impacts led to the various technological discoveries made by these countries. Country like China were able to breakthrough technologically by giving her young ones relevant technological and science education at the secondary level and this has helped the country to compete vigorously with countries like U.S.A, Russia, Japan and Germany in the development of newly technological devices.

The knowledge of science and its associated skills cannot be achieved without science education. However, in view of the positive roles of science and its bye-product technology in a country's development, science teachers play greater roles in providing scientific contents and the implementation of the science curriculum needed for the nation's development. According to the National Policy on Education (NPE 2014), the science component of the Senior Secondary School core subjects includes: Physics, Chemistry, Biology, Agricultural Science and Mathematics.

It has been observed that no nation can rise above the level of the teachers. Teachers play an important role in nation building, such in areas like economic, political, technology and sociological sphere. The teacher stands out as one of the most important factors determining the quality of education and its contributions to national development. Yusuf (2002) described teachers as the largest most crucial input of an educational system. Therefore, a teacher is one who had undergone a professional training specialized in a field of study and is employed to bring up and teach the learners (students) for self development of the society and the nation.

Hence, having discovered the role of science, the significance of science subjects, and the importance of science teachers at the secondary school level, it is observed that most of the public secondary schools in Oyo State lack adequate science teachers. Presently, there have been shortage of qualified science teachers in the public secondary school in the State, whereas some schools in the State are without certain science teachers like Physics and Chemistry resulting to zero knowledge in the areas, this situation reduces the option of junior secondary students who are moving to senior secondary level to pick options in art and social science due to lack of science teachers in majority of the public secondary schools in the State. This shortage has led to poor performance of students in science related subjects in the State and has also decreases the quality of output (students) produced by the educational system and this has led to failure of the educational system to produce quality science students.

The introduction of new subjects into the curricula of secondary schools has led to rapid increase in the demand for more qualified science teachers in many schools, as this is mounting a lot of pressures on the teachers as there has not been massive employment of teachers to cope with the increase in enrolment. Although qualified teachers are needed in the science and non-science subjects, the demand for qualified teachers appears to be more pronounced in science subjects than in non-science subjects. Also, some science teachers are leaving for higher paying private sector jobs after a few years. As a result, many teachers who remain are being asked to do more. Some schools in the State are being forced to increase class sizes due to shortage of science teachers. These and other factors as led to the demand and supply of science teachers in public secondary school in Oyo State. Considering the rapid expansion in science and technology, and student's enrolment in secondary schools in Oyo State, the lopsidedness in the distribution of qualified science teachers into secondary schools in Oyo

State, Nigeria, constitutes the problem which this study intends to examine. In this regard there will be an in-depth look at other various factors that determine the demand and supply of science teachers in post primary public schools in Oyo State.

**Objectives of the Study**

The following objectives were raised to guide the study:

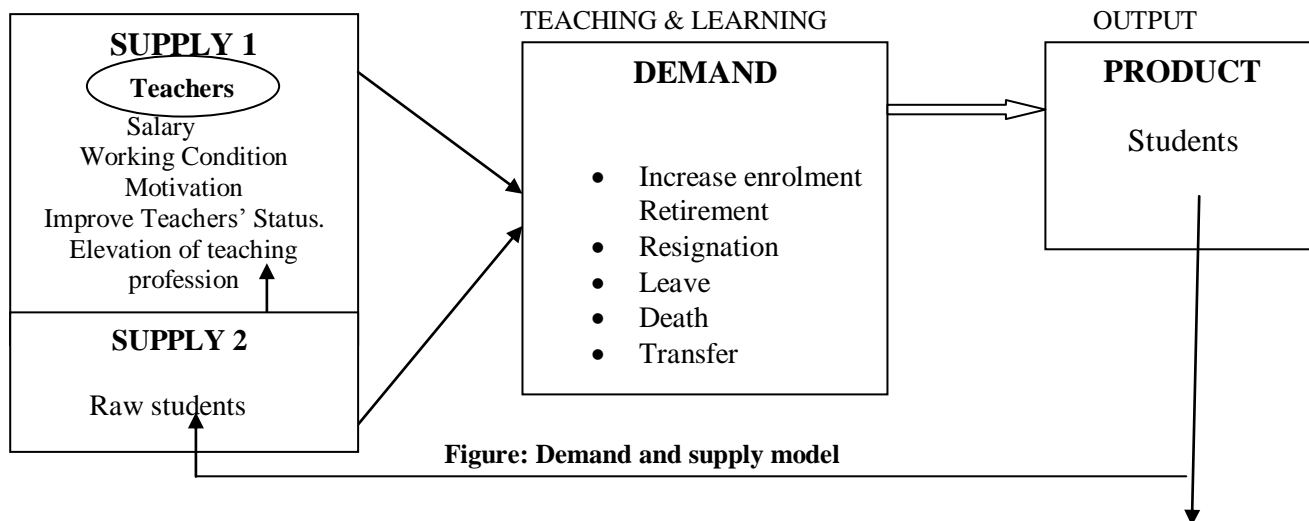
- (a) determine the number of required science teachers in public secondary schools in Oyo State;
- (b) ascertain the number of available science teachers in public secondary schools in Oyo State;
- (c) identify the factors responsible for science teachers’ shortage in public secondary schools in the State

**Research Questions**

The following research question were raised to pilot the study:

- 1. What are the numbers of available science teachers in public secondary schools in Oyo State?
- 2. What are the numbers of required science teachers in public secondary schools in Oyo State?
- 3. What are the factors responsible for science teachers’ shortage in public secondary schools in the State?

**Theoretical Framework**  
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The study will be premised on Demand and Supply theory. The proponent of Demand and Supply theory is Adam Smith the founding father of economics. Basake (2013) touched upon his perceptions of markets and how they operate. Writing of the price system, which is built on the theories of supply and demand, Smith Stated that it was the invisible hand which guides the actions of consumers and producers. The analysis for the supply and demand model is explained below.

## Supply

Supply is the willingness and ability of a producer to supply goods at a given price. Price determines the seller's actions. At higher prices, more of the commodity will be available to the buyers. This is because the suppliers will be able to maintain a profit despite the higher costs of production that may result from short-term expansion of their capacity. Both factors of demand depend on the market price. When the market price for a product is high, the demand will be low. When price is low, demand is high. At very low prices, many consumers will be able to purchase a product. As the price increases, the same amount of money will purchase fewer products. When the price for a product is very high, the demand will decrease because, while consumers may wish to purchase a product very much, they are limited by their ability to buy.

With the following assumptions "the lower the price, the higher the demand, the higher the price, the lower the demand, the higher the price, the higher the supply, the lower the price, the lower the supply it therefore implies that; if the wages of science teachers is low the higher the demand for their services.

In the model, the higher institutions of learning are the Universities, Polytechnics, and Colleges of Education which are the suppliers of science teachers. They produce and supply teachers for all the levels of Education in the society. Teachers as embodiment of labour force supply their services for the production of economics goods and service (teaching) in the labour market. The factors which determine the supply of teachers are salary, good working condition, motivation, teachers' status, and elevation of teaching profession. The law of supply which State that: the higher the price, the higher the supply, the lower the price, the lower the supply. It therefore implies that the higher the wages or salaries of science teachers the more willing, they will be ready to offer their services. Also, it implies that if the teaching profession becomes enterprises, more applications will apply to study to become science subjects' teachers, thereby increase the supply of science teachers, and vice verse.

## Demand

Demand is the rate at which consumers want to buy a product. Economic theory holds that demand consists of two factors: *taste* and *ability to buy*. Taste, which is the desire for a good, determines the willingness to buy the goods at a specific price. Ability to buy means that to buy goods at specific price. Secondary school education occupies a unique position in the educational system of a nation. It is the level of education that determines the academic and professional career of students. For secondary school education to achieve its stated goals there is need for the system to have the required human and non human resources. The teachers as human resource are those who deliver the art of teaching in schools. It is the teacher who ultimately interprets and implements the policy as represented in the school curriculum, which is designed to actualize educational goals. The demand for science teachers are determining by the following factors: students' enrolment, retirement, resignation, leave, death, and transfer of science teachers are factors responsible for the demand for science teachers in the secondary school level. The increase in students' enrolment in school will lead to demand for more science teachers, while other factors such as retirement, leave, transfer, resignation of science teachers, and death will cause shortage of teachers which would then lead to demand for more science teachers in the school.

## Product

A product is any tangible goods or service that is a result of a process and that is intended for delivery to a customer or end user. According to the model, the school system is an interdependent system which receive raw materials (students) from the society, processed it for a given period of time and then release it back to the society as finished product. The students are the raw materials which the school system impacted through the process of teaching and learning to transfer societal norms, believes and values so as to be useful to oneself and to the society at large. The output of the educational system is the student.

## **Society (Supply 2)**

The society is the receiver of all educational output (students). The societies which serve the school system with raw materials also stand as the end receiver of the school product. The school system and the society are interdependent on each other. The school cannot exist without the society because all the materials being use in the school to make it effective are taken from the society. The society which is the environment of the school system plays an important role for the educational system to function well. Also, the higher institution of learning which produce trained teachers received raw candidates from the society processed it and make it available for the secondary school system. It can be finally said that the inputs, after undergoing transformation process, in form of teaching and learning will be send back to the society. The products of the school system are supplied back to the environment for the societal usage.

This study will also be anchor on human relations theory. The proponents of the human relations theory include Mary Pecker Follett (1868-1933), and Elton Mayor (1945). In human relation theory, the central idea is that human factor is important in the achievement of organizational goals. It is believed that it is only when individuals are treated humanely that they can have the motivation to participate actively in the achievement of organizational goals. The focus of human relations theory is on people and how they interact. The basic problem of any organization is the building and maintenance of any relationship among the various groups of people within the organization. Mary Pecker Follett was the first great proponent of human relations theory, Follett emphasized on coordination as the basics of any organizational effectiveness. Follett developed four organizational principles which are centered on coordination. These principles include: Coordination by direct contact with the people concerned, Coordination in any organization should not be delayed, Coordination should involve an agreement of all individuals, an administrator should always be coordinating people, their work and other resources at all times (Oladayo 2015).

The work of Mary Follett was later expanded by Elton Mayor, Dickson and Roethlisberger through an empirical research. The study was carried at the Hawthorne plant of the western Electric Company, near Chicago in the State of Illinois in the United State of America, on the relationship between components of job and worker's satisfaction. The researchers established that worker-satisfaction was not a factor of economic incentives alone, but a combination of non-economic factors related to levels of interaction among workers, team work and ability of management to pay attention to human situations. These considerations laid the foundations of the study of personnel management (Adeyemi 2011). Other researchers on human relations like Lewin, Lippitt and White carried out a study on the effects of democratic, authoritarian and laissez-faire leadership styles on eleven year old Children. From the result of their research, they recommended democratic approach as the best form of leadership style. This emphasized the basic concern of Mary Follett, that a good human relation promotes healthy organizational climate and worker productivity.

The relationship between human relations theory and the present study which is the demand and supply of science subjects teachers is that both of them concentrate on inter-personal relationship between management and workers, this is because if there is no coordination the turnover rate will be high leading to shortage of science teachers, (human relations theory) stresses motivation, meeting worker's needs and aspiration; thereby enhancing high retention of teachers and reducing over attrition and encourage students to choice teaching as a profession, thus, demand and increased the supply of teachers to meet the constant demand for science teachers which are stressed in human relations theory.

## **II. Methodology**

This study adopted the descriptive survey research design. The population for the study comprised 629 public secondary schools and 1130 science subjects' teachers in public secondary schools in Oyo State. The sample for the study consisted of 75 secondary schools and 225 science teachers using multi-stage sampling procedure

for selection. Simple random sampling technique was used to select five Local Government Areas from each of the three senatorial districts making a total of 15 Local Government Areas. From each of the Local Government Areas, five secondary schools were selected using simple random sampling technique making a total of 75 schools. In the schools, three science teachers (Physics, Chemistry and Biology teachers) were purposively selected, making a total of 225 science teachers. The instrument used for data collection was a self designed questionnaire. The questionnaire aimed at eliciting responses from the science teachers on determinants and management of demand and supply of science teachers in public secondary schools in Oyo State. However, the questionnaire provided comprised four sections; “A,” “B,” “C” and “D” which contains different items. Section “A” of the questionnaire was based on the personal data of the respondents. Items under the section include: gender, class, no of years in service, and so on, whereby section “B” contain the school information of the respondents, section “C” contains information on number of science students and number of available science teachers while section “D” contains information on factors responsible for shortage of science teachers. The questions were grouped accordingly based on the research questions they answer. Face and content validity of the instrument was validated by experts in the Department of Educational Management, Obafemi Awolowo University and the test re-test method was adopted to achieve the Cronbach’s Alpha reliability coefficient of 0.713, this shows that the instrument is reliable. Data collected were analysed using frequency counts, means, standard deviation and percentages to answer the research questions raised.

### III. Results

**Research Question 1:** What are the numbers of available science teachers in public secondary schools in Oyo State?

**Table 1:** Available science teachers in Oyo State public secondary schools (2019-2021)

| <b>Senatorial District</b> | <b>No of Available Biology Teachers</b> | <b>No of Available Chemistry Teachers</b> | <b>No of Available Physics Teachers</b> | <b>No of Available Science Teachers</b> |
|----------------------------|---|---|---|---|
| <b>Oyo South</b>           | 287                                     | 128                                       | 93                                      | 508                                     |
| <b>Oyo Central</b>         | 199                                     | 103                                       | 74                                      | 376                                     |
| <b>Oyo North</b>           | 112                                     | 78  | 56                                      | 246                                     |
| <b>Total</b>               | <b>309</b>                              | <b>223</b>                                | <b>1130</b>                             | <b>598</b>                              |

Table 1 showed the available science teachers in public secondary schools in Oyo State during the period under study. In Oyo South Senatorial District, the findings showed that there were 287 Biology teachers, 128 Chemistry teachers and 93 Physics teachers making a total of 508 available science teachers. Also, in Oyo Central Senatorial District, there were 199 Biology teachers, 103 Chemistry teachers, and 74 Physics teachers making a total of 376 science teachers. In Oyo North Senatorial District, there were 112 Biology teachers, 78 Chemistry teachers, and 56 Physics teachers making a total of 1130 science teachers in Oyo State public secondary schools in 2019/2020 session.



**Research Question 2: What are the numbers of required science teachers in public secondary schools in Oyo State?**

In other to answer this research question, number of students was divided by the standard students' Teacher ratio 35:1. That is, number of students divided by 35. This was done in all the sampled schools both in the rural and urban areas.

**Table 2:** Number of Required Science Teachers in some selected Public Secondary Schools in Oyo State (2019-2021).

Table 2 showed the required number of science teachers in some selected public secondary schools in Oyo

| Senatorial District | No of Required Biology Teachers | No of Required Chemistry Teachers | No of Required Physics Teachers | No of Required Science Teachers |
|---------------------|---------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| Oyo South           | 50                              | 42                                | 40                              | 132                             |
| Oyo Central         | 42                              | 37                                | 37                              | 114                             |
| Oyo North           | 39                              | 33                                | 33                              | 103                             |
| <b>Total</b>        | <b>131</b>                      | <b>112</b>                        | <b>110</b>                      | <b>349</b>                      |

State. In Oyo South Senatorial District, the findings showed that out of the 50 Biology teachers required in the senatorial district in 2019/2020 session, only 26 science teachers were in post leaving a shortage of 24 Biology teachers. In the same vein, out of the 42 Chemistry teachers required in the senatorial district in 2019/2020 session, 25 Chemistry teachers were in post leaving a shortfall of 17 Chemistry teachers. Also, out of the 40 Physics teachers demanded in the senatorial district in 2019/2020 session, 25 Physics teachers were supplied leaving a shortage of 15 Physics teachers. Out of the 132 science teachers required in the schools in 2019/2020 session, 76 science teachers were in post leaving a shortage of 56 science teachers.

Also, table 2 indicated the number of available science teachers and required number of science teachers in public secondary schools in Oyo Central Senatorial District of Oyo State. The findings showed that out of the 42 Biology teachers required in the senatorial district in 2019/2020 Academic Session, 25 Biology teachers were in post leaving a shortage of 17 Biology teachers. In the same vein, out of the 37 Chemistry teachers required in the senatorial district in 2019/2020 session, 25 Chemistry teachers were in post leaving a shortfall of 12 Chemistry teachers. Also, out of the 37 Physics teachers demanded in the senatorial district in 2019/2020 session, 25 Physics teachers were supplied leaving a shortage of 12 Physics teachers. Out of the 114 science teachers required in the schools in 2019/2020 session in the senatorial district, 75 science teachers were in post leaving a shortage of 39 science teachers.

Finally, in Oyo North Senatorial District, the findings show that out of the 39 Biology teachers required in the senatorial district in 2019/2020 session, 25 Biology teachers were in post leaving a shortage of 14 Biology teachers. In the same vein, out of the 33 Chemistry teachers required in the senatorial district in 2019/2020 session, 24 Chemistry teachers were in post leaving a shortfall of 9 Chemistry teachers. Also, out of the 33 Physics teachers demanded in the senatorial district in 2019/2020 session, 25 Physics teachers were supplied leaving a shortage of 8 Physics teachers. Out of the 103 science teachers required in the schools in 2019/2020 session in the senatorial district, 74 science teachers were in post leaving a shortage of 29 science teachers

**Research Question 3: What are the factors responsible for science teachers' shortage in public secondary schools in the State?**

**Table 3:** Factors Responsible for Science Teachers' Shortage.

| Items                 | Agree (%)     | Disagree (%) | Mean (%) | STD    | RANK            |
|-----------------------|---------------|--------------|----------|--------|-----------------|
| Retirement            | 104 (64.88%)  | 79 (35.12%)  | 2.244    | 0.675  | 4 <sup>th</sup> |
| Increase in Enrolment | 169.8 (75.4%) | 55.2(24.56%) | 1.954    | 0.7148 | 1 <sup>st</sup> |
| Resignation           | 127.4(283.1%) | 97.6(47.38%) | 2.356    | 0.7058 | 2 <sup>nd</sup> |
| Leaves & Transfer     | 126.6(51.22%) | 117 (48.78%) | 2.528    | 0.735  | 3 <sup>rd</sup> |

Table 3 showed the average scores of respondents on factors that are responsible for science teachers' shortage in the study area in Oyo State. The findings showed that an average of 104 (64.88%) of respondent agreed that retirement of science teachers without replace reduce the number of science teachers. Meanwhile, 169 (75.4%) of the respondents agreed that the size of the population/enrolment in the school is a major factor responsible for shortage of science teachers. It was revealed that the increase in students' enrolment leads to shortage of science teachers in the schools. However, 127.4 (283.1%) of the respondents agreed that resignation of some science teachers from teaching service leads to the shortage of teachers in public secondary schools in Oyo State. likewise, 126.6 (51.22%) of the respondents agreed that females science teachers on leaves causes shortage of science teachers and transfer of science teachers Without replacement causes shortage of science teachers in Public secondary school in Oyo State.

Therefore, from the ranking in the table, the findings showed that increase in student enrolment serve as the major factors responsible for science teachers' shortage as it takes the first ranking, followed by retirement of science teachers that take the second position. Resignation of science teachers takes the third position while leaves and transfer of science teachers take the fourth position.

#### IV. Discussion

The study findings are appropriately discussed one after another. According to the findings, it was discovered that the available numbers of science teachers were not adequate to the number of required science teachers in most of the sampled schools. It was found that there was shortage of science teachers on subjects' basis such as Biology, Chemistry, and Physics in the schools. The numbers of teachers in post in these subjects were in great shortage to the number required. This finding was in agreement with the findings made by Popoola & Adepoju (2009) who found shortage in the number of teachers in science subjects in secondary schools in Nigeria. In the same vein, the findings of this study agreed with the findings of Adeyemi (2011) who found considerable shortage of science teachers in public secondary schools in Ondo State Nigeria. The finding was also in agreement with the findings of Pogodzinski (2000) who reported shortage of teachers in most of the public secondary schools in California.

The findings from the study indicated that the major factors responsible for shortage of science teachers in public secondary schools in Oyo State. It was found that retirement of teachers is one of the factors responsible for shortage of science teachers, as some science teacher go on retirement every year without being replaced by the government. This finding was also in agreement with the findings made by Victor & Pertunia (2012) who



fingering retirement as one of the major causes of teacher's shortage. Some teachers disengaged on the account of age or length of service. These groups of people have worked for a stipulated period of time. They are those who have reached the mandatory 60 years of age or have served the maximum 35 years in service as a result; they are due for retirement or disengagement from the service of teaching service commission of the State.

The study also identified increase in enrolment as one of the factors responsible for science teachers' shortage. In the study, it was discovered that increase in science students' enrolment in public secondary schools in urban areas of the State is more pronounced than schools in the rural areas in the State. This finding was in agreement with the findings made by Popoola & Adepoju (2009) who found that increase in student's enrolment led to shortage of teachers in secondary schools. This idea was supported by Adeyemi (2011) who viewed increase in student's enrolment as the major determinant of teacher demand, others determinant he noted include, student - teacher ratio, the range of subjects taught, school population, class size, number of periods per week and the size distribution of the class.

Likewise, the result of the findings showed that resignation of science teachers and the quietness of science teachers from teaching to other profession are factors that determine the demand for science teachers. This was in line with the findings of Oladayo (2015) who noted that some science teachers have withdrawn their services for other establishments like the industries, private jobs, and self-employment or taking up non-teaching positions. Smithers & Robinson (2003) reported that in most cases, the teachers withdraw from service without replacement leaving their places of work vacant.

Furthermore, findings revealed that Leaves, such as maternity leave, casual leave and sick leave are of factors responsible for science teachers' shortage. This finding was in agreement with the findings made by Ogunmade (2006) who found that some female science teachers who go on maternity leave were not replaced. Also, transfer of science teachers without replacement was also responsible of the shortage. Some science teachers were been transferred to another schools without making replacement for the transferred science teachers.

## V. Conclusion

In view of the finding of this study, it was concluded that, the number of available science teachers is less than the number of required science teachers in Oyo State public secondary schools. Also, the factors responsible for science teachers' shortage are: increase in students' enrolment, attrition, resignation of science teachers, going on maternity leave, poor motivation, government policy as regards the compulsory retirement age, and transfer of science teachers without replacement.

## Recommendations

Based on the findings of this study, it was therefore, recommended that the state government should employ adequate number of science teachers to public secondary schools. Teaching Service Commission should adequately distribute the required number of science teachers needed in each public secondary school in the State. Also, the State Teaching Service Commission should always and timely make replacement for retired teachers, transferred teachers and teachers on leave, in Oyo State Public Secondary schools. the activities of the Parent Teachers Association could be doubled by assisting the government by recruiting PTA science teachers to make a better replacement.

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