

## **Women in S&T Employment in Nigeria**

By

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### **ABSTRACT**

Socio-cultural attitudes strongly influence the level of women's participation in S&T. While there are common trends determining women's participation in S&T, there are important variances from culture to culture and region to region. Review of literature shows a dearth of information on women's participation in S&T in Nigeria both in the educational and in the practice of the profession. The work is on the post graduation occupational activities of female S&T graduates (FSTG) and the specific objectives are to: identify employment pattern of female S&T graduates and assess the performance of women in S&T occupations.

A survey conducted in July 2006 in the six geo-political zones of Nigeria collected information from the Heads of Department or immediate boss of FSTG and employed FSTG. Information is provided on demographic, graduation figures, degrees obtained, working conditions and environments, career advancement, women friendly policies etc. Data was compared with information on other countries. Appropriate policy recommendations are suggested to enhance the proper positioning of women in S&T in order that the nation may benefit from their training.

### **Introduction**

Scientific literacy promotes the development of a capable work force, economic and physical well being, and the exercise of participatory democracy. This kind of literacy is necessary for the workforce required by modern industries, but it is also necessary for informed public involvement in public policies. S&T is often not considered an appropriate occupation for girls and women, for reasons ranging from lack of intellectual ability to expectations that women work inside the home.

Science and technological activities have been defined as a set of systematic activities which are closely concerned with the generation, advancement, dissemination, and application of scientific and technical knowledge in all fields of science and technology. These include activities such as R&D, scientific and technical education and training, and scientific and technological services.

The demand for scientists and engineers in the technology-driven global economy is ever increasing. It has been recognized that women trained in S&T constitute an under recognized but important potential resource.

While there are common trends determining women's participation in science and technology, there are important variances from culture to culture and region to region. For example, in many countries the participation of women in engineering is extremely low. However, in the former Soviet Union all sub-specialties of engineering had high percentages of women, and women made up 70% of the engineering students at the Universidad Nacional de Ingenieria of Nicaragua in 1990 (Huyer and Westholm, 2000).

In Africa, while the overall enrollment of women in higher education is still much lower than men's, enrollment in science courses is lower still. At the University of Science and Technology in Ghana in 1986/87, women made up 16% of students in the natural sciences, 2.1% in engineering, 21.9% in the medical sciences, 10.2 % in the Faculty of Agriculture, and 10.9% in the Faculty of Architecture. A 1992 study showed that less than 10% of the total enrollment in science and engineering courses in Nigerian Universities are female (STAN,1992). Although there is little information on women's participation in S&T education in developing countries, one study on women's enrollment in tertiary-level engineering, medical, and health-related courses in Africa, Caribbean and Latin America and Asia show that rates for participation in engineering courses range from 1.6% in Kenya to 26.5% in Colombia, and for medical and health-related courses, where women are more highly represented around the world, the rates range from 24.7 in Kenya to 68% in Nicaragua, the exception being a participation rate of 77% in the Philippines (Huyer and Westholm, 2000).

Although there is little data available on women's participation in S&T, it is nonetheless clear that sweeping generalizations based on identified trends and simplistic conclusions will be of little value in increasing women's participation in national S&T. It is essential to design, implement and monitor, with the full participation of women, effective, efficient and mutually reinforcing gender-sensitive policies and programmes, including development policies and programmes, at all levels that will foster the empowerment and advancement of women.

Review of literature shows a dearth of information on women's participation in S&T in Nigeria both at the tertiary level and in the practice of the profession. The main aim of this work is to study the post graduation occupational activities of female S&T graduates and the specific objectives are to: study the enrollment and graduation pattern of female in S&T tertiary institutions (ii) identify types of employment female S&T graduates engage in; (iii) assess the factors influencing the performance of women in S&T occupations and (iv) make recommendations that would enhance women participation in S&T.

## **Data Collection**

A survey was conducted in July 2006 in the six geo-political zones of the country - Abuja (North Central), Bauchi (North East), Kano (North West), Port-Harcourt (South South), Lagos (South West) and Enugu (South East). In each zone, the study covered universities, polytechnics, colleges of education and research institutes in the fields of engineering and the natural sciences excluding medical and pharmaceutical sciences. It was assumed these graduates would usually not practice outside their field thus the exclusion. Financial institutions such as Auditing firms, Banks, Insurance Companies were visited to determine the number and performance of FSTG employed in their establishments. Structured questionnaires and interview guides were employed to solicit information from FSTG employed in S&T organizations. Purposive sampling technique was used to select 25 engineering firms each in the six zones, 600 employed females graduates each in the zones, 60 Heads of Department in Tertiary Institutions in each of the zones, and 5 Exams and records units of Tertiary institutions in each of the zones. A pilot test was conducted in Akure, Ondo state to validate the four sets of questionnaires. At the end of the pre-test, the questionnaires were amended to reflect the experience gained at the pre-test and thereafter used for the main survey. The information gathered was sorted and coded. The Statistical Package for Social Sciences (SPSS) was used for data analyses.

## **Results and Discussions**

### **Demographic information**

Fig. 1 shows the geographical spread of the respondents. The Federal Capital Territory Abuja i.e. the Nigerian political capital had the highest number of FSTG (35.3%) respondents while the known economic cities Lagos and Kano had about 9.7 and 3.9% of the respondents' respectively. The small number of Female Science and Technology Graduates (FSTG) from Lagos and Kano is not expected as these industrial cities have a sizeable number of industries, which are expected to employ more ST graduates. Information on age of respondents (Fig 2) showed that the largest proportion 42.5% was aged between 20 and 30 years followed by 39.2% in the 31-40 years bracket. About 15.5% of the respondents were aged between 41 and 50 years while only 2.8% were above 50 years. This result suggests that most of the respondents were young with about 81.7% less than 40 years old. The result of a 1997 US survey showed that women in the S&T workforce are younger, on average 49% as scientists and engineers in 1997 had degrees within the previous 10 years (Huyer and Westholm, 2000).

As at the survey time, about 40.2% of the respondents were single while 52.9% were married. Other respondents were separated (2.6%), divorced (2.4%) or widowed (2.0%) all totaled about less than 10%. Further analysis showed that 73.1% of the single respondents were aged between 20 and 30 years while a similar percentage of those in age bracket 31-40 and 41-50 were married. Respondents that were separated, divorced or widowed were aged 41 years and above. For the married respondents, 62.7% of the spouses are Civil Servants, 19% work in private organizations while about 16% are self-employed. Only a small proportion of the spouses (2.3%) are clergy men. This result shows that with about 80% of the spouses (Fig. 3) being not self employed mobility of the FSTG would be highly linked or restricted by that of the husband.

Data on the number of children of FSTG revealed that a large number of respondents (45%) have either 2 or 3 children, 21.7% have only one child and 3.4% have four or more children. Further analysis of age of respondents and number of children showed that 50% of FSTG who had only one child were aged between 20 and 30 years, while those who have 2-3 children are between 31 and 40 years of age. Of the FSTG aged ranging from 41 to 50, and above, only 4.2% of the respondents have only one child, 39.1% have 2-3 children and 45.6% have 4-5 while 11.2% have more than 5 children. Thus 56.8% of the older FSTG (>41 years) have more than four children. The younger respondents have less number of children and this may have implications on job performance.

### **Educational Accomplishment**

A high proportion of the FSTG (68.5%) have at least a first degree from the University (Fig. 4). Of the 1357 respondents, 68.5% are graduates of universities, 23.4% are graduates of Polytechnics while 8% finished from Colleges of Education with the National Certificates of Education (NCE). Of the Polytechnic graduates, 19.6% obtained the Higher National Diploma (HND) certificates while 6.8% received the Ordinary National Diploma (OND) certificates. The high proportion of university graduates is remarkable considering that socio-cultural attitudes strongly influence the level of women's participation in the university (Huyer and Westholm, 2000). This result is similar to that of Turkey that has a comparatively high rate of participation of women in university sciences, unusual in the region. This is as a result of a government policy of national development since the early 1990s. High participation rates of women in sciences in Latin American universities have been attributed to the effects of structural adjustment programmes which hit the universities hard (Huyer and Westholm, 2000). Among the university FSTG about 10.4% graduated with a First Class Honors degree, 49% had Second Class Upper Division, 35.8% Second Class Lower Division and about 4.8% a Third Class. Amongst the FSTG of Polytechnics, 53.5% graduated with Upper Credit, 44.8% had Lower Credit and only 1.7% graduated with a Pass certificate. Table 1 shows the distribution of Class of degree obtained by the Field of study. This result indicates that the women not only have the ability to study S&T courses but also to perform excellently in their chosen field.

Data in Fig. 5 shows how many of the FSTG have obtained higher degrees. More than 40% have a Masters degree while some 8.3% have a doctorate degree. About 25% have Bachelors degree and the others HND. These group of women probably consider these post graduation degrees based on their initial point of entry in to the engineering field i.e. HND graduates would consider B.Sc. a higher degree as would OND graduates consider HND a higher degree. It should be noted that that there are large variations in the organization of education systems in different countries and in the classification of education by levels. In the physical science and mathematics in the US, women earn fewer than 20% of the doctorates. In engineering, they receive a little over 10% of the PhDs (Huyer and Westholm, 2000).

Fig. 6 shows the year of graduation of respondents. The number of females studying S&T has increased tremendously over the years with 70% of the respondents graduating between 1990 and 2000. This suggests an increased awareness amongst female secondary school pupils and the interest and capability to excel in these courses is affirmed by the Class of degrees obtained at the tertiary level.

S&T courses were grouped into the following broad areas **Science** (Biology, Biochemistry, Botany, Zoology, Geology, Engineering physics, Mathematics, Chemistry, Physics), **Engineering** (Electrical and Electronic, Mechanical, Civil, Computer, Chemical, Materials and Metallurgical, Agricultural, Food, etc.), Environmental Design and Management (EDM – Urban and Regional Planning, Quantity Survey, Architecture, Building, Town Planning, Estate Management), Agriculture (Plant Science, Soil Science, Animal Science, Agricultural Economics, Extension and Rural Sociology ) and Education (Science education courses). Of these disciplines, the highest proportion of respondents studied Science courses (61.4%) followed by 23.5% who studied engineering courses. Science courses in EDM, Agriculture and Education were studied by 6.2%, 7.4% and 1.5% respectively. This result indicates that Science and engineering courses are highly sought after by female secondary school leavers. Shirley (1999) reported that women now earn more than half of all College degrees, and over half of those are in the life sciences in the US. The comparative small number of female students studying courses in EDM, Agriculture and or Education could be due to poor awareness of the potential job opportunities or that these groups of respondents were not readily available during the survey.

Respondents were asked if the course studied was the original course of interest for which they applied for admission. Results showed that about 74.3% of the FSTG were given admission to study their preferred courses while 25.7% responded in the negative. The University admission process allows for an applicant to be offered admission in courses other than those applied for as long as the subject and qualification criteria are met. When students are compelled to study what was not their desired course, this sometimes affects their attitude to work and academic performance. Table 2 shows that respondents would have loved to study courses in faculties like Arts, Administration and the Humanities. The larger percentage (76.6%) would still have wanted courses in S&T but the professional courses like Medicine, Pharmacy, Engineering and Science in that order. Agriculture is the least desired S&T course and this is due to the poor perception of agriculture as not being a prestigious course. The nation has to popularize the study of agriculture amongst the youth if there is to be any meaningful development in that sector.

When asked if the FSTG had role models or mentors that encouraged them to study S&T courses (in a perceived male dominated environment) about 49.6% said yes and 50.4% said No implying that they had no role models. Of those who had role models, 36.5% of the role models were male while 63% had female role models. Parry (2002) observed that women tend not to choose female mentors because men are better connected to the right networks. Although about 50% of the respondents had no role models or mentors but for those who had, a high proportion are female which suggests the need to publicize the successes of female achievers as this will encourage the younger ones to emulate them.

Hypatia research in Nova Scotia reports girls saying they cannot do S&T because 'you have to be really smart'. Young women expressed the following concerns: they may end up as isolated professionals consumed by the work, a career in S&T and having a family are mutually exclusive or that to be successful in S&T they have to follow the patterns set by men (Armour, 2003). This agrees with the submission of Shirley (1999) that more women engineers should tell their stories in a publicly appealing way. Mentors benefit as much from mentoring as mentees. Woodd (2000) reported that the ability to mentor first year students, giving them encouragement and academic advice, gave the staff strength to continue, and having a faculty mentor gave the students encouragement not to give up. Role models continue to be important especially on the campus. In an effort to assist women undergraduates, several colleges and universities in the US have developed programs to promote research experiences and mentors that foster their consideration of engineering careers (Fox, 1998).

When asked what motivated the women to study S&T courses, their responses showed that personal interest (40.8%) was the greatest motivational factor followed by academic competence (26.3%). Some 14.2% of the respondents felt they wanted to challenge the status quo (i.e. the common belief that girls cannot cope with S&T courses because it involves a lot of mathematical computations). Better financial returns from high paying jobs motivated about 17.7% of the respondents to study S&T courses. Parental influence was not a significant factor in choice of course studied as less than 1% of the respondents indicated this option. The ability to challenge the status quo is because of the endowment in understanding S&T subjects. Thus, personal interest and academic competence are the main factors motivating female pupils to study S&T. the brilliant academic record on graduation of respondents do support this result i.e. class of degree obtained on graduation.

On challenges encountered in the course of study, gender discrimination (39.4%) topped the list followed by sexual harassment (25.1%), financial constraint (31.4%). Other issues but of less significance (i.e. indicated by only a small number of respondents 0.6%) was domestic related or personal problems. However, a small fraction (<1%) indicated that they found the academic curriculum challenging. Most of those who had domestic challenges were married; some had babies during the course of study and were distracted by domestic responsibilities. S&T courses are quite challenging demanding one's full concentration, but combining this with domestic responsibilities makes studying a daunting task. Although personal interest and academic competence are the motivating factors for women studying S&T courses, 86.2% of respondents believe that girls need to be encouraged while 6.8% do not share this view. Respondents recommended the following measures to encourage greater participation of girls in studying S&T courses: i) immediate employment (36.7%), ii) scholarships and award of bursaries 46%. However, a notable proportion of respondents (16.8%) suggested a deliberate admission quota for female students or applicants to ensure that a minimum number are offered admission. Of the respondents who believe girls should be encouraged to study S&T courses, 90% believe that this is necessary to bridge the gap in male female participation. Others indicated that encouraging female pupils would encourage the natural tendencies and give them a sense of belonging.

### **Employment record and performance**

Many of the FSTG experienced delay in getting employment for various reasons. About 23% went for higher degrees on graduation while some 36.8% indicated there was lack of suitable positions where they lived. About 15.5% of the respondents indicated that the class of degree was a limiting factor and lack of funds hindered some 21.8% from gaining immediate employment by not been able to travel to attend interviews, etc. Respondents indicated no gender discrimination during interviews or while seeking employment. Bogg and Sartain (2001) reported that about 30% of new B.Sc. graduates do not immediately seek employment. Instead, they pursue graduate study either full time or part time. Lack of suitable employment suggests that respondents lived in locations with little or limited S&T job opportunities. Further analysis indicated that these women were married and were restricted to such locations as commitment to their spouse.

Response on departments of S&T in which women are employed showed 3.6% in manufacturing, 8.1% in Quality Control and 34.7% in Administration (including Planning and documentation). A high proportion (47.7%) of the FSTG works in R&D. the remaining work as lecturers in tertiary institutions. The results show that less than 12% are in manufacturing while the majority either works in Administration or in R&D. Of the FSTG who work in non-S&T units, the results show that some 46.2% work in Administration, 20% in Accounts, 9.5% in Audit and 22.9% in Public Relations Units. This result indicates that about 30% of S&T graduates are employed in financial institutions which imply that these groups of women do not put their professional S&T skill to full use. A public opinion survey in the US in 1997 indicated that young talented people were more attracted by “higher-status” jobs in the non-S&T sectors such as finance, banking, insurance and real estate (Huyer and Westholm, 2000). Women comprise less than a quarter of the total science and engineering labor force in the US and family related reasons such as the demands of a spouse’s job or the presence of children have been given for this low participation in the S&T workforce, as well as cultural norms, or personal preferences (Colwell, 2001). The S&T workforce appears very exclusive and this is dangerous for the nation. The talent of every worker is needed in order to compete and prosper. Table 3 shows the sectors of S&T in which responding FSTG are employed. FSTG were asked if assignments were given or distributed on gender basis, less than a third i.e. 28.8% said yes but the majority 71.2% indicated a No implying that the FSTG were given equal opportunity to prove their worth even in tasks such as welding, automobile repair and assemblage, wood and woodwork processing, going on night shift and field work.

Results on position of women in the place of work showed about 16.4% in the managerial post, 27.3% as Supervisors, 51.3% in the middle level and the remaining 5% are in the junior cadre positions. About 9% of the respondents work as academics in tertiary institutions. The number of FSTG in management appears low but is comparable to what obtains in other countries. Shirley (1999) reported that by the middle of the 1970s Jet Propulsion Laboratory (JPL) had about five female engineers but by 1999 the workforce of JPL was 15% female. The author also noted that women are just beginning to penetrate the ranks of technical management. Galant and Mouton (2005) observed that although the

proportion of women gaining scientific degrees has increased significantly in recent decades, the proportion of women reaching the very top of the scientific hierarchy remains low. To a large extent the limited number of women in senior positions is attributed to continued discrimination in the workplace (unfair appraisal system, favoring males; inequitable remuneration), making accommodations to family and personal life, lack of 'old boys' network, lack of openings in management, etc. (Ramguttty-Wong, 2001). If they take a break, to either have children or to look after family, returning to the world of S&T can be difficult. Time away from the laboratory leads to unfamiliarity with novel technologies and state of the art equipment. Retraining is an expensive and time consuming affair. One of the consequences of the lack of women in senior leadership positions is that women are unable to make input into decision making which impacts on them (Galant and Mouton, 2005).

Of the non S&T departments in which FSTG were employed, Administration has the highest proportion 43.3% followed by the financial units (accounts and audit 33.4% and public relations unit in the third position with 22% and others 1.2% e.g. Library. The FSTG were asked why a large number of them take up non S&T employment, about 40% indicated that at the time of employment, there were no alternative offers. About 19% wanted a change in career while a similar proportion was of the opinion that career in S&T was too demanding. Some 22.7% of the respondents abandoned S&T employment for greener pastures or more attractive opportunities. It is interesting to note that just about 0.2% changed jobs or took up non S&T employment on domestic grounds. However, the 40% of FSTG that are engaged in non S&T employment on the grounds that they were no vacant S&T positions may actually be due to domestic issues i.e. moving to a town where the spouse is employed and would for the sake of the family being together take up any alternative employment. When asked if respondents knew of other FSTG working in non S&T employment, 34.6% indicated a yes and 65.4% a No. Of those who were aware about 46.5% of the respondents knew between 1-5 female friends or colleagues employed in non S&T organizations. Some 30% of the respondents each know about 10-15 FSTG working in Non S&T establishments while about 24% knew either more than 16 or more FSTG engaged in non S&T tasks.

On the issue of job satisfaction, 80.5% of the respondents indicated that they were satisfied i.e. in the affirmative while the remaining 19.5% were not satisfied with their present employment. Of those that had no job satisfaction, they complained about the long distance they travel to get to work from home while others indicated poor fulfillment on the job. The major factors giving job satisfaction are i) satisfactory emolument (80.5%) and ii) good working conditions. Ramguttty-Wong (2001) reported on career progression of women in the service sector in Mauritius that 24% were strongly dissatisfied and admit feeling they are hitting against a glass ceiling because they have never experienced any change in their job situation. For the married respondents, performance of their reproduction functions clashed with their jobs mainly in two dimensions: about 66.6% indicated inability to travel and 33.3% identified insufficient time for research by FSTG working either in academic institutions or in R&D laboratories. A few of the unmarried respondents complained of serious discomfort during the monthly menstrual cycle which sometimes necessitated time off work.



In order to enhance the performance of the female workforce, respondents indicated some gender friendly policies adopted by their organizations. About 50% of the respondents have enjoyed maternity leave with pay, 22.9% are given time to pick kids from school in the afternoons. Working for half a day for three months after the maternity leave was indicated by 15.4% while 11.8% indicated that they went on maternity leave without pay. Majority of those who went on maternity leave without pay are employed in the private sector and work either in manufacturing or R&D units of these establishments. On the other hand, respondents who have enjoyed maternity leave with pay or half day are employed in government parastatals or academic or research institutions. When GCHQ (a British enterprise) recently introduced flexible working patterns and allowed four women scientists to work flexibly following maternity leave, the organization reckons to have saved some £400,000 by retraining these four talented and experienced people (British Council, 2001). Retaining skilled female employees has become an economic necessity. AstraZeneca a pharmaceutical company in the UK, had woman friendly policies with job shares and flexible work plans, including parental leave for both sexes and home working (Parry, 2002). This result calls for a closer look at the working conditions in private organizations vis-à-vis adoption of policies that foster gender friendly environment. Considering in addition, that national trends in work and family patterns point to increasing difficulties with child care, intensifying work pressure and longer working hours for women, along with increasing female employment in the growing service sector, it would seem more than urgent that appropriate policies and practices be put in place to address the issue nationally and sectorally (Ramguttty-Wong, 2001).

Some S&T organizations did not have any female working in S&T departments. Some of the reasons given include i) distraction of reproductive activities (36.4%), ii) lack of skill (24.1%), iii) the strenuous nature of the job to be done and iv) inadequate qualifications (18%). Some of these excuses are discriminatory in nature and should attract attention. This suggests that reproductive activities of the female work force are yet to be seen as a positive contribution to socio-economic national development. This result agrees with the report of Huyer and Westholm (2000) that S&T is often not considered an appropriate occupation for women and girls, for reasons ranging from lack of intellectual ability to expectations that women work inside the home.

Head or immediate boss of the respondents was asked to rate the performance of the FSTG staff compared to their male counterparts in the following areas: number of articles published, qualification, experience, and ability to meet set target and interpersonal relationships. About 29.1% of the respondents were ranked between 81-100%, 38% had 61-80%, and 19.7% got 41-60% while 13.2% had less than 40%. This shows that the majority of the FSTG performed satisfactorily at work (above average). It should be noted that women's reproductive responsibilities clash with their professional responsibilities. The child bearing and intensive childrearing years collide with important years for gaining tenure. For this reason, women in the US universities tend to be older than their male colleagues at the same level. A study of science staff in ten African universities showed that women were consistently less represented in each

teaching rank, and increasingly less so as one moved up the university hierarchy (Huyer and Westholm, 2000). Apart from the tertiary or research institutions where number of published articles is a promotion criterion, basis for promotion in most organizations have similar criteria including: academic qualification (27.7%), number of years at a position (20.9%), ability to meet set target (20.9%) and leadership quality (15.1%).

Responses on how often FSTG were considered for in-service training showed that 34.3% attended a training at least once a year. Some 21.6% indicated that they participated more often say 2-4 times in a year. However, a large proportion of respondents 37.9% said they had never been on any training program since they were employed. A few of the respondents 6.1% reported occasional participation at training programs (not frequent but as determined by the management). Further analysis showed that majority of respondents who had a poor record of in service training is employed in private organizations. The benefits of in service training cannot be over emphasized as it refreshes old knowledge while getting acquainted with new practices resulting in better output. Bogg and Sartain (2001) observed that the success of modern scientists and engineers is increasingly dependent on 'continuing education' or lifelong learning. Private organizations should be mandated by both the government and the professional engineering bodies like Council of Registered Engineers in Nigeria (COREN), etc to ensure retraining of staff of such establishments.

### **Conclusions and Policy Recommendations**

The right of women to equal access to advancement and empowerment is a reason to encourage women's participation in and contributions to engineering, science and technology. Socio-cultural attitudes strongly influence the level of women's participation in S&T. Women need to have more say in how the world around them operates. To this end, it is necessary to continue to prepare and promote women throughout S&T enterprise. A diverse workforce composed of men and women is a more creative workforce capable of challenging old attitudes and practices and bringing fresh thinking and greater innovation to product development. The viewpoints of one group are very likely new to others. This newness fuels creativity. Women have distinct skills to offer science. They are pragmatic problem solvers-networkers who operate best in teams and they are more socially aware than men. Shirley (1999) reports that in Japan women are slowly entering the creative workforce. Toshiba broke the tradition by recruiting women scientists and engineers and now 10% of its R&D workforce is women. In order to recruit a more diverse workforce, having a quota for female employees may be seen as devaluing women – as in 'only here because of the quota'.

The result of the survey suggests that there has been increased awareness amongst female secondary school pupils and the interest and capability to excel in S&T courses at the tertiary level. Furthermore, in the course of study, female S&T students face more challenges as a result of gender discrimination from male colleagues than from the academic curriculum. The gender discrimination arises from social stereotyping which affects our attitudes and expectations. This calls for enlightenment of the society on change of attitude to gender roles, as this would affect acceptability of women who venture into male dominated professions.

Employment pattern showed that most FSTG work in Administration, Finance or R&D departments and that a high proportion take less paying non-S&T jobs for domestic reasons and lack of suitable vacancies. This is gross underutilization of human resource. The initiative by the Federal government to create more jobs through industrial development should be encouraged, as this would create more employment opportunities for the underutilized human resource to be put to optimal use. In addition, the Federal government should initiate affirmative actions to employ more women in the S&T sector as has been done by some countries such as South Africa, Britain, etc.

Domestic issues and responsibilities constitute primary challenges women S&T professionals face that affect their performance and progress at work. Employers of labor to create environment conducive to the reproductive years of the female S&T workforce should put measures in place. Child bearing and rearing are positive contributions the female make towards providing human resource and should therefore not be a limiting factor in the advancement of women. Many developed nations have low birthrates because the women do not want their careers to hinder their professional progress and now the governments of these nations pay the women who choose to give birth as a form of encouragement in order to boost their population growth. Working conditions have been improved to elongate maternity leave and also have flexible working hours to accommodate this period in a woman's life while contributing their potential to economic growth and development of the nation. Both the government and professional S&T bodies need to pay closer attention to the working conditions of women in the private sector. A situation where women go on maternity leave without pay is not acceptable and should be redressed. In addition retraining or participation in refresher courses should be enforced for all enterprises employing skilled human resource as this can only improve their output and reputation of the company.

#### *Purposive recruitment and retaining policies*

Some businesses in Britain introduced management processes that attract and retain women in S&T. e.g. are Rank Xerox, GlaxoSmithKline, Unilever, Government Communications Headquarters – GCHQ, etc. some of the schemes covered include: better maternity benefits, phasing in women returning from career breaks, flexible working hours for parents, paid leave for unexpected family emergencies, child care and holiday pay schemes, networks for women managers, dual career planning, and experience (not age) recruitment criteria (British Council, 2001). Rank Xerox reduced loss of over 80% of skilled and experienced women non-returners to less than 20%. Over five years, this brought a 'return' of some £1 million through savings in recruitment, retraining and lost productivity. Some companies offer 'keep in touch' programmes while others offer women the option of returning on a part-time basis initially after a career break.

#### *Networks for women with careers in S&T*

There is need to promote education, training and practice of S&T among women and raise the profile and effectiveness of women engineers and scientists by forming links and networking with other organization. These organizations contribute to policy

formulation, acts as a forum, a mutual support network, an information base and a collective voice for women in S&T. discussions via e-mail and Internet may be hosted on the websites of these associations which can be used to inform policy. In 1999, the Parliamentary Office of S&T conducted an on-line consultation on the subject of women in SET, in collaboration with the Hansard Society and the Women in Higher Education Register (British Council, 2001). Professional women organizations such as Association of Professional Women Engineers in Nigeria (APWEN) should be more visible and be heard promoting successful female engineers and scientists in an environment that will attract young women, retain them through college and sustain them in the world of work. Many international women organizations on science and engineering exist with Nigerian chapters e.g. TWAS, TWOWS, etc. but the impact of these chapters is yet to be felt.

#### *Mentors and role models*

Role models or mentors that encouraged FSTG to study S&T courses (a perceived male dominated environment) were a motivating factor for some of the FSTG. Of these role models, the study revealed a high proportion of them to be female which suggests the need to publicize the successes of female achievers as this will encourage the younger ones to follow in their footsteps. On campus, female engineering students are unlikely to have many female faculty or administration as role models. They will be lucky to have one or two female teachers during their college years. The leadership in the college is not concerned with the commitment to women's education as it is to the technical quality of the program especially research. Thus, the onus lies on professional associations to feature and promote successful female engineers and scientists. High flying women in senior posts must be visible to girls (British Council, 2001). Some organizations have formalized the establishment of internal networks for the career development of younger women. Unilever has established a voluntary network of female managers to give women a forum for discussion (British Council, 2001).

#### *Internal networks*

Companies can encourage the creation of active and empowering women's organizations in the company that can provide 'places and spaces' for women's voices to be heard (e.g. Hewlett Packard's Women's Networks and the JPL Advisory Council for Women). The JPL Advisory Council for Women has provided not only a voice for women but for all employees, resulting in the establishment of a child care center (Shirley, 1999).

It is essential to design, implement and monitor, with the full participation of women, effective, efficient and mutually reinforcing gender-sensitive policies and programmes (e.g. flexible schedules, job sharing, telecommuting, family leave, retirement benefits and help with family care), including development policies and programmes, at all levels that will foster the empowerment and advancement of women.

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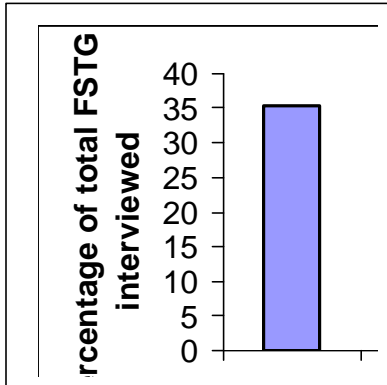
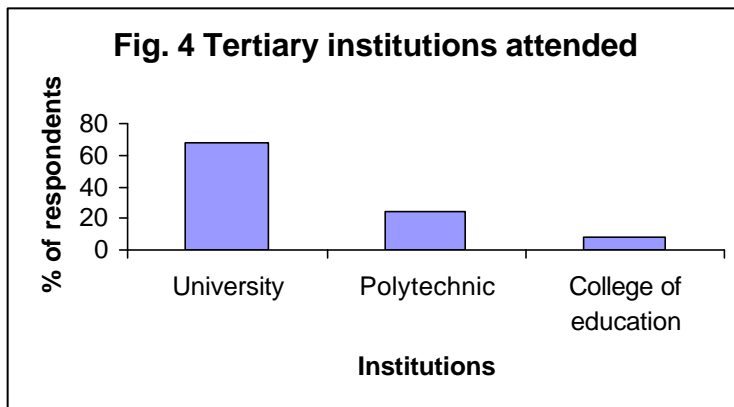
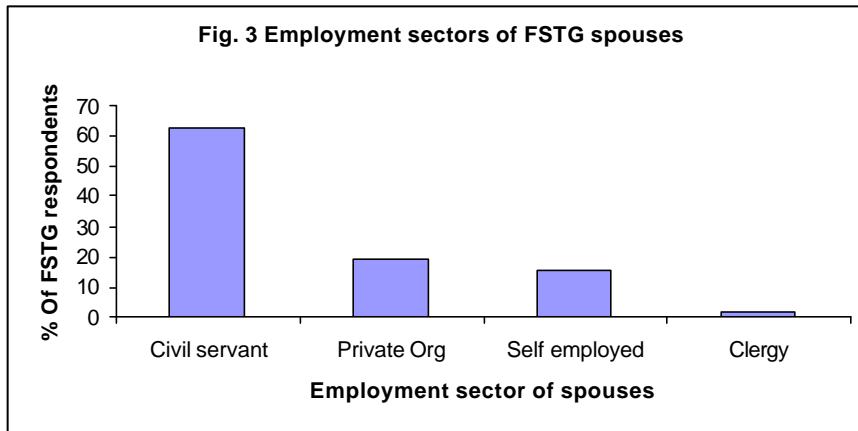
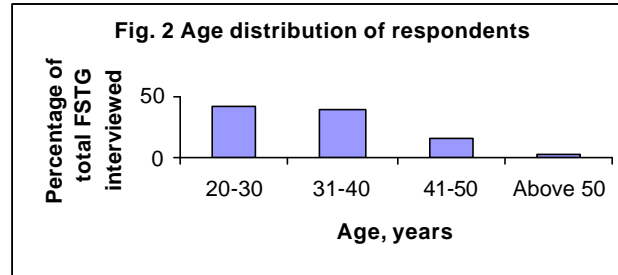


Fig. 1 Nigerian towns in which FSTG were inter



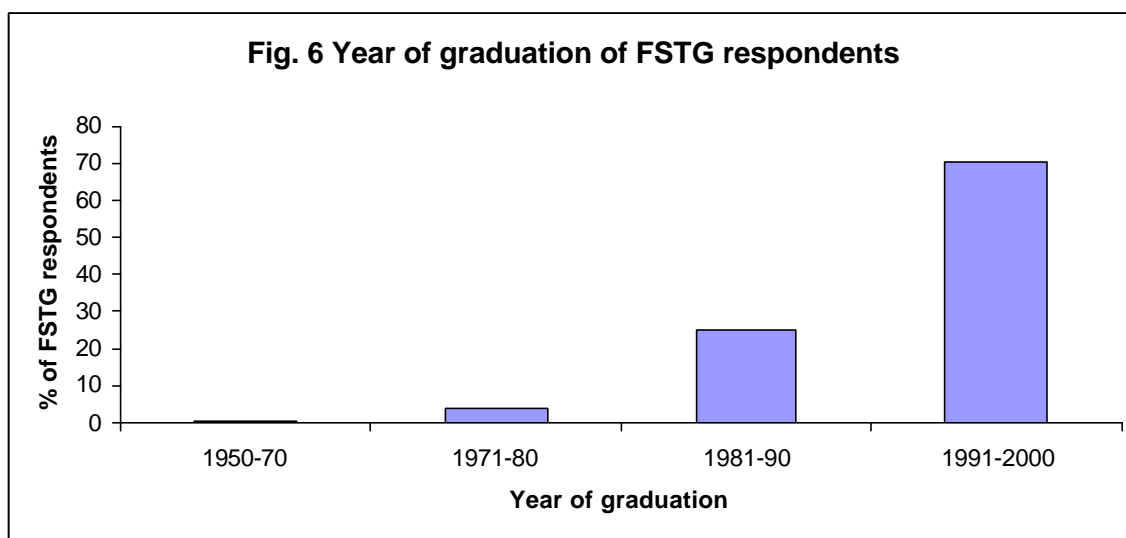
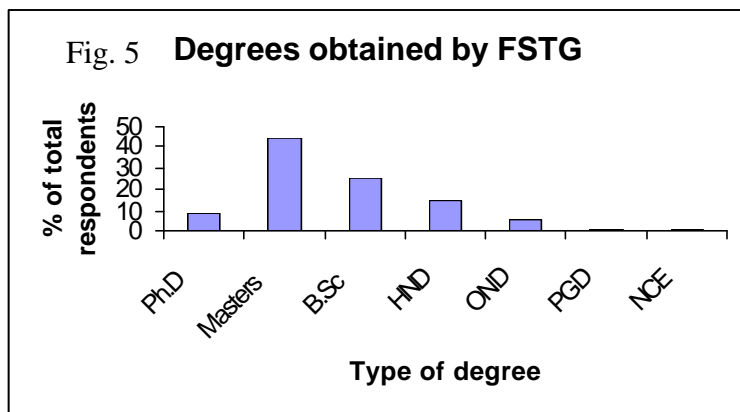


Table 1: Field of study of FSTG and Class of Degree Obtained

Field of study	University					Polytechnic	
	First Class	Second Upper	Second Lower	Third Class	Pass	Upper Credit	Lower Credit
Science	52	262	181	23	1	50	34
Engineering	25	119	68	6	0	22	6
EDM	4	21	19	6	0	9	5
Agriculture	4	38	16	5	0	5	9
Science Education		3	10				
Total	85	443	294	40	1	86	54

<b>% total</b>	<b>8.5</b>	<b>44.2</b>	<b>29.3</b>	<b>4.0</b>	<b>0.1</b>	<b>8.6</b>	<b>5.4</b>
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Table 2: Field of study and what the FSTG respondents would have loved to study

	Sci	Eng.	Agric.	Health Scienc es	Pharm	Soc/Sci.	Admin	Humanities
Science	36	38	3	45	37	20	16	5
Engineer ing	7	14	0	7	4	2	4	0
EDM	4	3	3	2	9	3	4	1
Agric	4	1	4	5	5	4	1	0
Sci. Edu	1	0	0	1	0	7	1	3
Total	52	56	10	60	55	36	26	9
% total	17.1	18.4	3.3	19.7	18.1	11.8	8.6	3

Table 3: Sectors in which FSTG are employed

Sector of Labour Market Where FSTG are Employed	Frequency	% Response
Engineering firms	11	19.6
Food, Beverage and Tobacco companies	5	8.9
Chemicals, plastic and rubber companies	3	5.4
Basic metals, iron and steel companies	6	10.7
Pulp, paper and paper products firms	3	5.4
Information Communication Technology companies (ICT)	15	26.8
Wood and woodwork companies	3	5.4
Electrical and electronics companies	5	8.9
Non metallic mineral product (e.g. glass, ceramics, etc. companies	2	3.6
Motor vehicle & miscellaneous assembly companies	3	5.4