Polytechnics - Industries Partnerships: A Necessary Tool for Enhancing Work Skills Acquisition of Electrical and Electronic Engineering Students.

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Abstract

The study is designed to investigate the partnerships existing between polytechnics – industries and ways of facilitating the partnerships. Two research questions and a hypothesis guided the study. In carrying out this study, survey design was adopted. The study covers polytechnics and electrical industries in Niger State. The target population for this study was made up of 20 Lecturers, 32 Industrial Personnel's and 126 ND II Students. The respondents were selected using purposeful sampling techniques, having a total of 110 respondents; 20 Industrial personnel, 15 Electrical/Electronic Engineering Lecturers and 75 National Diploma (ND II) Students. 32-items questionnaire which was validated by three experts was used to collect data. The data collected was analyzed using mean and analysis of variance (ANOVA). The findings revealed that there are partnerships in the following areas; placement of students for industrial training and supervision and there is no links and partnerships in provision of facilities and sponsorship of researches in the institutions. Polytechnics – industries should jointly organized seminars/conferences. It is recommended among others that; Industries should sponsor researches and practical activities in polytechnics, a system should be developed to enable practicing professional engineers from industries to work in polytechnics even on part time bases and the industrial advisory board of polytechnics should be constituted which should consist among others Alumni and industrial personnel.

Introduction

Reflecting on the comfort and luxuries derived from the use of electrical and electronics appliances such as; Refrigerators, Air-conditionings, Radios, Televisions, Electrical motors and other Electrical and Electronics equipment used in residential, public institutions and industrial areas. We cannot but appreciate electrical and electronic engineers who designed and produced such great products. But what happens when the gadgets and machines breaks down or malfunction? The maintenance and repair of these gadgets and machines call for training and retraining of electrical and electronic engineering technician.

Raymond (2007) Sees technicians as one who possess skills and technical knowledge about trade and use the knowledge and skills to construct, operate and maintain machineries. He added that electrical and electronic technicians are involved in detection, location and repairs of faults as they occur in electrical and electronics systems. The nation is witnessing a great development in the area of technology and more in the field of electrical and electronic. This implies that the technicians ought to be kept abreast or constantly re- trained to cope with the development in the field of electrical and electronic. Technical Education Programme is responsible for the production and re-training of Electrical and Electronic Engineering Technicians. Skill and knowledge are the driving force of economic growth, social and political development of any country. Countries with higher and better level of skills adjust more effectively to the challenges and opportunities of globalization.

The typical tasks on Electrical and Electronic Engineering Technicians are more challenging as they required quality training and re-training to meet up with the tasks. Some of the typical tasks are as follows (Pritchard, 1986).

1. Electrical engineering technicians are involved in the generation, transmission and distribution of electrical energy to residential, public institutions and industrial areas.

2. Electronics Engineering Technicians help engineers to provide a very wide range of sophisticated products for our homes and offices. These include; personal computers, television, control systems for heating, cooking and washing, multimedia information systems.

3. Technicians support the work of engineers in a wide range of areas, including research and development, design, technical drawing, maintenance and quality control and assurance.

4. Electronics Engineering Technicians also carry out maintenance and repair of telephones, radios, televisions, aircraft and satellite system.

5. Electronics Technicians can connect laptop computers into programme logic controllers, which control production equipment and machinery. The laptop displays the fault and the technicians can carry out a repair or re-programme the faulty equipment.

6. Electronic Technicians use traditional and high tech tools, such as computer – aided design (CAD) systems to create realistic geometric models of objects which can stimulate and analyze the effects and potential problems with the designs.

7. Electrical Technicians are involves in servicing and maintenance of solar power, gas turbine, coal turbine, hydro- turbine.

The Electrical and Electronic Engineering Technicians are not born but made, they originated from Polytechnics education. The leading qualities of a good engineer with technical ability, imagination and solid judgment is upon proper interaction between the school and industry. Zahid (2008) stated that the major responsibility of Polytechnics/Engineering Institutions is to produce trained manpower to meet the needs of industry/professional sector. The products of these institutions must satisfy the actual needs, requirement and expectations of the local industry/professional sector, since engineering is the application of science to solve problems, especially by the use of machines. Igbomauchel (1994) remarks that, one of the sole objectives of the National Policy on Education is to build a self-reliant Nation. To achieve this, the country has to train her citizens adequately to meet the challenges of the fast changing industrial technologies. In line with this objective, it is therefore pertinent that there is a practical need for industry participation in ensuring quality manpower training. Roth (1987) reasoned that school – industry linkage represents a means to contributing to quality training programme. The challenge to industry to succeed in an increasingly competitive world market is contingent upon skilled personnel who learn, grow and adapt to challenging market and techniques. Industry has a survival stake in quality training. Nwokolo (1990) asserted that there is a great relationship and interdependency on the Polytechnic education and the actual job practices. Therefore one can rightly postulate that in the pursuit of technological competence, industry occupy an indispensable position.

Ojo (1986) stressed that as a result of the new trends in the development of modern industrial machines the training institution alone cannot cope with the demands of quality training in engineering and technology. He further observed that if the institutions will have to keep abreast with growth in industries who are the major employers of these graduates then, a

stronger tie has to be established between them. It is paramount important that there should be more institutionalized liaison and communication between educational institutions and industries in the area of curriculum design and implementation. Zahid (2008) emphasized that industries need to play its effective role as they are the one to utilize the product (graduates) of institutions. Furthermore, both industries and institutions should take advantage of joint research projects. Input from the industrial sector to be ongoing process to ensure the training needs of industry is taken care off. Industry should seek greater involvement in national education and training policy making. Industry should provide representation on national education and training bodies, policy-making bodies of Engineering Institutions. Interaction between Industries and Engineering Institutions is vital for the successful and sustainable development. Representatives from the industry are encouraged to have input into curriculum development process through an advisory committee.

El-Raghy (1999) stated that a good relationship between the institution and industry facilitates the placement of students for training and provide case studies for enriching the delivery of the curriculum. He further added that some type of industry supervision of students under training should be offered by the training place, while institutions staff may pay visits to follow the progress of students during their time in the industry training. Al Jumaly and Stonyer (2000) argues that the development of the graduate engineer cannot be a classroom based experience, rather it requires the involvement and commitment of industry to be involved with engineering programmes one of the strategies to achieve this, is through the development of partnerships between industry and education.

Currie (1996) while advancing reasons for strong cooperation between industry and the training institutions for quality technology programmes said most industries of modern times are profit minded. There should be a strong cooperation between the industry and training institution. In support of this, Atsumbe (2006) stated that if there is strong co-operation between the school and industry then the right caliber of skilled personnel will be trained to meet the challenges posed by modern industries. He emphasised that if partnership between education and industries is formed the

school system will share common needs, problems, issues, strengths and weakness. Currie (1996) pointed out several benefits during his research work for both schools and industry arising from partnership such as:

- Improved teaching quality and curriculum enrichment.
- Improved student learning in a majority of courses
- Enhanced knowledge, skills and attitudes in a majority of students.
- Improvement in the range and quality of learning environments available to schools.
- Influencing the formation of skills in the labour force and increasing staff development opportunities.
- Sharpening competitive abilities and improving employee motivation.
- An enhanced ability to counsel students over career and choices.
- Gaining a license to operate in the community.
- Seeing the wide applicability of teaching and learning strategies that value teamwork, interpersonal skills and problem solving.
- Improving product and company image and public relations.
- Enhancing the perceived relevance of science and technology through the use of real world problems and examples.
- Enhancing the ability to recruit a science and technology literate workforce.

Statement of the Problem

The level of development in electrical and electronic industries at both public and private sector of Nigeria economy depends on the level of electrical and electronic engineering technicians. But today, the performance of engineering graduates from Nigerian Universities and Polytechnics has been a major subject of concern from most industries in Nigeria. Most industries complaint that good number of graduates produce every year from universities and polytechnics lack necessary job-site skills required by the industry, this stem from inadequate skill requirement for most cutting edge technology, low practical knowledge and confidence (Atsumbe, 2006). Atsumbe further stated that the huge numbers of graduates from various engineering faculties of universities/polytechnics have failed to impact positively on the growth of industries for economic emancipation and industrialization; only few graduates from

these various institutions are employed annually. Most Nigerian engineering graduates are subjected to several re-training programmes (Kati, Taira, and Minna, 2007). Since most of the graduates are considered unemployable due to the training acquired from their various institutions and the training programmes are not addressing the growing need of the industry and society. A change of direction is required to close up the widening gap over a period of time between school and industry. Hence the need to facilitate school- industry links and partnerships as a requirement of enhancing work skills of electrical and electronic engineering technicians.

Purpose of the Study

The main purpose of this study was to investigate Polytechnics - Industries Partnerships: A Necessary Tool for Enhancing Work Skills Acquisition of Electrical and Electronic Engineering Students. Specifically, the study find out;

1. The state of partnerships existing between polytechnics and industries.
2. The ways are of facilitating the polytechnics and industries partnerships.

Research Questions

The following research questions were raised to generate answers for the study:

1. What are the state of partnerships existing between polytechnics and industries?
2. What the ways are of facilitating the polytechnics and industries partnerships?

Hypothesis

Null hypothesis were formulated at $p < .05$ level of significance.

Ho_1. There is no significant difference in the mean responses of Industrial Personnel, Lecturers and Students on ways of facilitating polytechnics - industries partnerships.

Methodology

A survey research design was adopted for this study; it involves the use of questionnaire to determine the opinions, responses and perceptions of respondents. The study covers; The Federal polytechnic Bida and Niger State Polytechnics Zungeru and Electrical Generating and Transmission industries in Niger State. The target population for this study was made up of 20 Lecturers, 32 Industrial Personnel's and 126 ND II Students. The respondents were selected using purposeful sampling techniques, having the total of 110

respondents; 20 industrial personnel, 15 Electrical/Electronic Engineering Lecturers and 75 National Diploma (ND II) Students. To establish the validity of the instrument for the study, the research instrument was subjected to both face and content validation. By experts in Industrial and Technology Education Department and Electrical and Electronics Engineering Department all in Federal University of Technology Minna to attest to the appropriateness of the instrument in measuring what it is intended to measure. Items rated low were discarded while suggested modifications were effected on finally produced questionnaire.

The data collected was analyzed using mean and Analysis of Variance (ANOVA) to determine the acceptance, the resulting mean scores was interpreted relative to the concept of the real lower and upper limits of numbers 1-4 as used on the rating scale adopted for the study. The decision point between the upper limit of 3 and lower limit of 2 being 2.49 and 2.50 respectively, this mean that items with mean values of 2.50 and above were considered as agreed while items with values of 2.49 and below were considered as disagreed For testing hypotheses, f-critical of 2.42 was chosen. Any value equal or less was considered not significant and above was considered significant.

Research Question 1.

1. What are the partnerships existing between polytechnics and industries in Niger State?

Table 1: *Mean Responses of Industrial Personnel, Lecturers and Students on Partnerships Existing between Polytechnics and Industries in Niger State.*

$N_1 = 30, N_2 = 15\ N_3 = 75$

S/NO	ITEM	X_1	X_2	X_3	X_t	Remarks
1	Placement of students on industrial work experience	3.43	3.21	3.02	3.22	Agreed
2	Supervision of students during industrial work experience	3.57	3.09	3.21	3.29	Agreed
3	Staff industrial training	2.23	2.00	2.34	2.19	Disagreed
4	Electrical industries assess students' practical projects.	1.56	1.65	2.01	1.74	Disagreed
5	Provision of facilities to school by the industries.	2.05	1.69	1.45	1.73	Disagreed
6	Industries contribute in curriculum development	2.65	2.24	2.34	2.41	Disagreed
7	School – industry organize joint seminar/conferences.	2.45	2.28	2.48	2.40	Disagreed
8	Students are allowed for industrial visits.	3.41	2.98	3.04	3.14	Agreed
9	Industries sponsor researches in schools.	2.43	2.01	1.87	2.10	Disagreed
10	Industrial personnel serve as guest lecturers	2.00	2.05	1.65	1.90	Disagreed
11	Industrial personnel are part of accreditation team	2.23	2.42	2.54	2.40	Disagreed
12	Participate in the employment of technical staff.	1.87	2.00	1.98	1.95	Disagreed
13	Train and re-train technical staff.	1.90	1.87	2.12	1.96	Disagreed
14	Schools invite industrial personnel to project exhibition.	2.04	2.16	1.69	1.96	Disagreed
15	Maintenance of polytechnics training facilities	1.78	1.42	1.53	1.58	Disagreed
16	Consultancy service	2.43	2.45	2 14	2.34	Disagreed
17	Cooperative work study	1.65	1.54	1.98	1.72	Disagreed

N_1, N_2 and N_3 = Number of industrial personnel, Lecturers and students respectively

X_1 =Mean responses of industrial personnel; X_2 = Mean responses of Lecturers

X_3 = Mean responses of students; X_t = Mean responses of all respondents

Table1. Shows that the respondents agreed on items 1, 2 and 8 as a current partnerships existing between polytechnics and industries and they jointly disagreed with other items.

Research Question 2.

What are the ways of facilitating industries – polytechnics participation in Niger State?

Table 2: ***Mean Responses of Industrial Personnel, Lecturers and Students on Ways of Facilitating Partnerships between Polytechnics and Industries in Niger State.***

$N_1 = 30, N_2 = 15\ N_3 = 75$

S/NO	ITEM	X_1	X_2	X_3	X_t	Remarks
1	School & industries should joint organize conferences.	3.45	3.24	3.06	3.25	Agreed
2	Placement of students for industrial attachment	3.65	3.45	3.01	3.37	Agreed
3	Industries should support polytechnics with facilities.	3.76	3.22	3.10	3.36	Agreed
4	Industrial personnel should form team of accreditation.	3.66	3.21	2.98	3.28	Agreed
5	Cordial relationship between lecturers & industrial personnel.	3.49	3.09	3.64	3.41	Agreed
6	Polytechnics should form industrial advisory board	2.98	3.33	3.65	3.22	Agreed
7	Constant supervision of students on training.	3.32	2.99	3.54	3.28	Agreed
8	Engineers in the industries should be given opportunity to lecture in polytechnics.	2.97	2.79	3.01	2.92	Agreed
9	Lecturers should be accepted for industrial training.	3.11	3.65	3.43	3.40	Agreed
10	Students should be allowed for industrial visits.	2.90	3.00	3.44	3.11	Agreed
11	Industrial personnel should be involved in employment of technical staff.	2.65	2.55	2.98	2.73	Agreed
12	Industries should sponsor research work in institutions.	2.95	3.34	3.11	3.13	Agreed
13	Industrial personnel should be involved in assessing student practical projects.	3.21	3.04	2.29	3.18	Agreed
14	School and industry should support cooperative work study.	2.76	2.97	3.23	2.98	Agreed
15	Lecturers should register with professional bodies.	2.79	3.00	3.23	3.01	Agreed

N_1, N_2 and N_3 = Number of industrial personnel, Lecturers and students respectively

X_1 =Mean responses of industrial personnel; X_2 = Mean responses of Lecturers

X_3 = Mean responses of students; X_t = Mean responses of all respondents

Table 2 revealed that the respondents jointly agreed to all the items as the ways to facilitate the links and partnerships between polytechnics – industries.

Hypothesis 1

Ho_1. There is no significant difference in the mean responses of Industrial Personnel, Lecturers and Students on ways of facilitating polytechnics - industries partnerships.

Table 4. ***One-way Analysis of Variance (ANOVA) of the Mean of Respondents on the Possible Ways to Facilitate the Links and Partnerships between Industries – Polytechnics.***

Source of Variation	Sum of Squares	df	Mean Squares	f-cal	f-critical	Decision
Between groups	1.09	2	0.545			
Within groups	588.12	108	1.16	0.470	2.40	NS*
Total	589.21	110				

* No Significant different

Table 4 revealed that the f-cal is less than f-critical this signified that there is no significant difference between the mean responses of Industrial Personnel, Lecturers and Students on the ways to facilitate the partnerships between industries – polytechnics in Niger State. Thus, the null hypothesis was not rejected.

Summary of Findings

The findings revealed that there are partnerships in the following areas:

1. Placement of students for industrial training.
2. Supervision of students on training.
3. Industrial visits.

The findings however, revealed that there are no partnerships in the following areas:

4. Staff industrial training.
5. Assessment of students' practical projects.
6. Provision of facilities to schools.

7. Cooperative work study.
8. Sponsorship of researches in institutions.

The respondents agreed on the following ways of facilitating partnerships:

9. Polytechnics – industries should jointly organized seminars/conferences.
10. Industries should support institutions with training facilities.
11. Industrial personnel should be involved in accreditation team.
12. Engineers in the industries should be given opportunity to lectures.
13. Polytechnics should form advisory board.

Discussion

Table 1 revealed the findings on the state of partnerships between polytechnics - industries. The findings shows that the respondents jointly agreed that there is a links and partnerships in placement of students for industrial training, supervision of students on training and industrial visits by the students. The outcome of this study is not coming as a surprise because the National Board of Technical Education (NBTE) introduces compulsory SIWES programmed for engineering students in polytechnics and this exercise is usually undergone in industries and related organization. Kofoworola (2003) observed that despite there are partnerships in the area of SIWES and industrial visits, the industries felt reluctant to place students in their industries and these student reluctantly received were not properly supervised. In support to this Igboamauchey (1994) lamented that the cordial links between school and industries have been absent. This problem renders SIWES ineffective, breading it attendant problems on placement, supervision and assessment of industrial training students.

The findings also revealed that there are no partnerships in the areas of lecturers' industrial training, provision of facilities to schools, and sponsorship of researches in polytechnics. These findings are not in line with the view of Currie (1996) which stated that for the graduates of our institutions to meet up with the challenges in industries there must be serious links and partnerships in the area of sponsorship of researches, provision of training facilities, teachers placement in

industries and industrial staff placements in schools and this has been liken in many institutions and industries.

Analysis in Table 2 revealed that the respondents agreed on all the items as a ways of facilitating partnerships between polytechnics and industries. The respondents agreed that for polytechnics and industries to partner in the development of nation's technology and economic growth. They must jointly organized seminars/conferences, support the institutions with training facilities and institutions should form industrial advisory board. These findings are in line with the views of Jon (1995) and Currie (1996) as they agreed that to facilitate the partnership there must be jointly organized seminars/conferences to allow industrial personnel and lecturers shared their experiences which will lead to the development of industries and institutions. Engineering institutions should form industrial advisory board which will consist of Alumni and representative of companies that employ significant numbers of institution's graduates. This can assist in private fund raising and provision of training facilities. Atsumbe (2006) recommended that government should constitute a school – industries advisory board to enhance the partnership between schools and industries. Kofoworola (2003) opined that if experience engineers can be convinced to work at the institutions, they will add their wealth of professional and practice experience to the development and improvement of engineering education.

Conclusion

The service of the competent Electrical/Electronic Engineering Technicians is very important in the development of national's technology and the survival of industries. They play a key role in the installation, servicing and maintenance of equipment and machineries. Since the Electrical/Electronic Engineering Technicians are not born but made from polytechnics and the industries. It is necessary for a strong relationship to exist between polytechnics and industries to enable institutions produce graduates capable of meeting the demand of dynamic technology.

Recommendations

The following recommendations were made in lined with the findings:

1. Government should be developed to enable practicing professional Engineers from industries to work in polytechnics even on part time bases; they will add their wealth of professional and practical experiences to the development and improvement of engineering education.

2. The industrial advisory board of polytechnics should be constituted which should consist of among others Alumni and industrial personnel. This will help in the provision of facilities.

3. Industries should sponsor researches and practical activities in polytechnics.

4. Industrial organization should give polytechnics Staff/Instructors opportunities to participate in industrial attachment, which will help them to improve these practical skills.

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