

RE-ENGINEERING COMPUTER SCIENCE EDUCATION FOR EMPLOYMENT AND SELF- PRODUCTIVITY IN YOBE STATE NIGERIA THROUGH RE-STRUCTURED SIWES

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Abstract

This paper sought to find out the position of Computer science students in three tertiary institutions in Yobe State Nigeria as regards the availability of modern Information Communications Technology (ICT)/Computer outfits in the State and the acquisition of modern ICT/Computer skills during Students Industrial Work Experience Scheme (SIWES). 126 students randomly selected from the three institutions involved in SIWES namely: Federal College of Education (Technical), Potiskum, Federal Polytechnic, Damaturu, and Yobe State Polytechnic, Geidam were used as sample for the study. Questionnaires were used for data collection. The result of the study using simple percentages, and a modified 4-point Likert scale with mean and percentages showed among others, that ICT/Computer establishments are available in the State. However, they are mostly computer Business centers where the students learn mainly typesetting and photocopying of documents. Recommendations were also made.

Training is a key factor in enhancing the efficiency and expertise of the workforce. The Students Industrial Work Experience Scheme (SIWES) program prepares students for labor markets. It has become an innovative phenomenon in human resources development and training in Nigeria (Ugwuanyi and Ezema, 2010).

The Student Industrial Work-Experience Scheme (SIWES) is a planned and supervised training intervention based on stated and specific learning and career objectives, and geared towards developing the occupational competencies of the participants. It is a programme required to be undertaken by all students of tertiary institutions in Nigeria pursuing courses in “specialized engineering, technical,

business, applied sciences and applied arts” (ITF, 2004a).

The growing concern among our industrialists that graduates of our institutions of Higher Learning, lack adequate practical background studies preparatory for employment in industries, led to the formation of students Industrial Work Experience Scheme (SIWES) by ITF in 1973/1974. Duration of SIWES is four months in Polytechnics at the end of ND I, four months in College of Education at the end of NCE II and six months in the Universities at the end of 300 or 400 or 500 levels depending on the discipline (Information and Guideline for SIWES, 2002).

Ugwuanyi and Ezema,(2010) pointed out that following the establishment of the Industrial training Fund (ITF), SIWES commenced in 1974 with the aim of making education more relevant and to bridge the yawning gap between the theory and practice of engineering, technology, and science-related disciplines in tertiary institutions in Nigeria. Ugwuanyi and Ezema, (2010) went ahead to say that the specific objectives of SIWES were summarized by the Federal Government in its *Gazette* of April, 1978 as follows:

- To provide an avenue for students in institutions of higher learning to acquire industrial skills and experiences in their course of study
- To provide students with an opportunity to apply their knowledge in real work and actual practice.
- To make the transition from school to the world of work easier and to enhance students contacts for later job placement.

From another perspective, the general objectives of SIWES were outlined as follows:

- Helping students break free from the theoretical world of textbooks and class courses and leap into the real world of applications of knowledge.
- Enabling the students to effectively interact in a work environment within a hierarchy of employees. The efficiency in working in groups and under higher authorities is tested during this course.
- Helping students to express dependability, initiative, resourcefulness and professionalism in the tasks they are assigned.
- To evaluate the person’s ability to communicate and operate under pressure, if required.
- To help students enhance their creativity and efficiency in dealing with projects related to their field of study.
- To enable students to pick up skills from the experience and projects of other employees to apply in their own tasks.
- To enable the student realize their relative strength in a field with many practical applications and help students come out with final year projects that model real life industry challenges. (Free Online Research Papers-SIWES Project in Computer Science)

Background of the Study

Computer Science Education is an area of learning that aims at equipping students with the required practical skills which they needed to survive in the work environment. Owing to the advancement in the Information, Communications Technology (ICT) world, every prospective career man in Computer Science should be fully informed practically if he is to cope with the demands of this dynamic area of endeavour. It is a well known fact that Computer is applied almost in every field of endeavour in our world today and the changes or advancement in this field seems to be on per second basis. This makes the challenge and demands on the future Computer Scientists enormous.

The students Industrial work experience Scheme (SIWES), by its objectives stated above holds the answer to these enormous demands. It is apparent that a lot of studies have been conducted on the effectiveness of the SIWES program since its inception in 1974. Until now, more researches are still taking place on the said scheme.

Wodi and Dokubo, (2009) did an appraisal of Students' Industrial Work Experience Scheme (SIWES) in five tertiary institutions in Rivers State Nigeria and reported that: lack of adequate supervision, non signing of necessary materials like ITF Form 8 and students' log-books at their places of attachment, difficulties of students in getting placement, unnecessary delay in the payment of students and supervisors' allowance among others were areas of weaknesses revealed. Recommendations given for improvement include among others: the visitation of ITF officers to other bodies involved including the students on attachment; and Federal Government to sanction in accordance with Decree No. 47 section 7A (1) B and

(2), any Ministry, Company or parastatals that fail to offer students placement for purposes of acquiring practical experience should be blacklisted and penalized heavily by the government, while tax holiday should be given to companies/establishment that comply.

On the other hand Olugbenga (2009), conducted a research on 'Towards Effective SIWES Curriculum Development in Applied Sciences for Adequate Skills Utilization: A Case Study of the School of Applied Science, Nuhu Bamalli Polytechnic, Zaria' and found out that:

- All the students agreed that SIWES helps to equip them with marketable skills which go to show that they know the importance of industrial attachment.
- Many students stated that their choice of placement of SIWES is not based on interest for future entrepreneurship development, but their convenience such as free accommodation and transportation etc. which the author noted that it will not help the students to have a solid foundation for future job plan.

- Some of the students who took part in the survey revealed that the place of their SIWES lack adequate modern facilities and personnel which is not good enough for the country's technological development.
- Some of the students claimed that there were some restrictions on the facilities they can use, which is not good enough for appropriate skills acquisition.
- Majority of the respondents believed that the duration of SIWES program is not enough for them to acquire skill that will enable them set up their own business ventures.

Moreso, Ugwuanyi and Ezema, (2010), in their research on the 'Challenges of Students' Industrial Work Experience Scheme (SIWES) in Library and Information Science in the ICT Environment' pointed out that the ICT environment has created a new *modus operandi* for the Library Information Science (LSI) profession by virtue of new tools for information exchange. They asserted that the new development poses a challenge to educators, practitioners, and students, in the following aspects: Digital Environment, New career specializations, information services and transformation of some specialized subject areas.

In view of the above findings, this paper intended to find out what the position of Computer Science students in tertiary institutions in Yobe state is as regards the availability of ICT/Computer outfits and the acquisition of modern ICT/Computer skills during SIWES.

Statement of the Problem

The growing concern among our industrialists that graduates of our institutions of Higher Learning, lack adequate practical background studies preparatory for employment in industries, led to the formation of Students Industrial Work Experience Scheme (SIWES) by ITF in 1973/1974 (Information and Guideline for SIWES, 2002).

A lot of factors would necessitate the achievement of its laudable objectives in Nigeria as well as Yobe State. However, the scheme has witnessed a lot of challenges since its inception, ranging from shortage of well equipped establishments or SIWES outfits, lack of proper students' supervision, difficulty in finding SIWES placements etc. These problems might not be synonymous with one group of SIWES students only.

For example, the available ICT/Computer outfits in Yobe State might not be enough to offer placement to the numerous Computer Science students in the State. If however, the ICT outfits are available, are they well equipped with modern ICT/Computer hardware and software for adequate skill acquisition? More so, how easy is it for computer Science students to find placement in Government parastatals and private outfits that work with modern ICT/Computer facilities in Yobe State?

Purpose of the Study

The major purpose of this study is to find out possible ways of re-structuring SIWES in Computer Science to achieve students' acquisition of standard skills that would necessitate their employment and productivity in their future career.

Specifically, the study sets out to:

- To investigate the extent of availability of standard ICT/Computer related organizations for students' skill acquisition in Yobe State.
- To find out the reasons why students find it difficult to secure placement in the existing Government and private outfits that make use of modern ICT/Computer equipment in Yobe State.
- To find out whether the level of experience acquired by this computer Science Students is adequate and commensurate for employment and productivity thereafter.

Research Questions

The study was guided by the following research questions:

- What is the level of availability of standard ICT/Computer related organizations in Yobe State for students' skill acquisition?
- Why do students find it difficult to secure placement in Government and private parastatals that work with the latest state of the arts facilities in Computer Science?
- Are the students really prepared for the practical challenges awaiting them in the work environment by the quality of the experience they acquire during SIWES?

Research Methodology

Design of the Study

The design of the study is a survey research design. The study therefore sought the perception of 126 Computer Science students on the effectiveness of the SIWES programme especially on the skills they have acquired on the training; whether these skills are adequate to offer them employment and to sustain them in their future work places.

Area of Study

The study was conducted in Yobe State, Nigeria. Yobe State is divided into three (3) political or administrative zones namely: zones A, B, and C. These zones are further divided into seventeen (17) Local Government Areas.

The study was specifically conducted in three tertiary institutions in Yobe State Nigeria, namely: Federal Polytechnic, Damaturu, Federal College of Education (Technical), Potiskum and Yobe State Polytechnic, Geidam. As at the time of this study, these are the institutions that have full-fledged Computer Science Departments whose students were participating in SIWES.

Population of the Study

The population for this study is three hundred and five (305) computer science students. These were the total number of computer Science students registered for the 2010/2011 session in the three institutions under study. The breakdown is as follows:

Federal Polytechnic, Damaturu	-	185 students
Federal College of Education (Technical), Potiskum	-	155 students
Yobe State Polytechnic, Geidam	-	65 students.

Sample and Sampling Technique

Simple random sampling technique was used for the study. The sample for the study consisted of one hundred and twenty-six (126) computer Science SIWES students selected randomly from the three institutions used for the study as follows: Federal Polytechnic Damaturu-53, Federal College of Education (Technical) Potiskum - 45 and Yobe State Polytechnic, Geidam – 28.

Instrument for Data Collection

The instrument for data collection was a well structured questionnaire with ten (27) items in two sections. Section A contained 13 multiple choice questions and section B contained 14 questions on a modified 4- point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) with numeration value of 4, 3, 2, and 1 respectively. The preliminary questions were meant to collect background information about the respondents.

Validity of the Instrument

Three experts in the School of Science Education, Federal College of Education (Technical), Potiskum validated the questionnaire. The instrument was restructured in line with the suggestions made by these experts before the questionnaire were administered. This was to ensure the content and construct validities of the instrument.

Reliability of the Instrument

Test-retest reliability was employed to test the reliability of the instrument using twenty (20) Computer Science SIWES students from Federal College of Education (Technical), Potiskum . Twenty (20) questionnaires were administered for the first time and after three weeks the same questionnaires were administered to the same twenty (20) SIWES students. The two sets of scores were correlated using the Pearson Product Moment Correlation Coefficient and the value of 0.82 was obtained which indicates a very high correlation between the two sets of scores.

Method of Data Collection

A total of 160 questionnaires were distributed and 126 questionnaires were returned. The instrument was administered by the Heads of the Computer Science

Departments of the institutions in question. The SIWES students were properly guided to fill the questionnaires correctly.

Method of Data Analysis

Data was organized using frequency distribution and the mean was used for data analysis. The mean scores were used to determine the perceived agreement level expressed on a modified 4-point Likert scale which was adopted for each of the items. A mean rating of 2.50 was used as the criterion level or cut off point for the level of agreement. This is the upper limit of the mean using the internal scale. A mean of 2.50 and above indicated agreement, while a mean below 2.50 indicated disagreement.

Presentation of Results

Research Question 1

What is the level of availability of standard ICT/Computer related organizations in Yobe State for students’ skill acquisition?

Table 1: Frequency, Percentage and Mean Distribution of the Rating of the SIWES Students’ Level of Agreement on the Items Evaluation of the Level of Availability of Standard ICT/Computer Related Organizations in Yobe State for Students’ Skill Acquisition

S/N	Item	SA	A	D	SD	Total	%A	%D	Mean (x)	Remark
1.	The Place of My SIWES is in a town in Yobe State.	58 232	09 27	50 100	09 09	126 368	70	30	2.92	Agreed
2.	My SIWES place is an ICT/Computer establishment.	55 220	43 129	13 26	15 15	126 390	89	11	3.10	Agreed
3.	The place of my SIWES had the latest ICT/computer equipment.	10 40	12 36	72 144	22 22	126 242	31	69	1.92	Disagreed
4.	My primary duties during SIWES was typesetting and photocopying documents.	45 180	50 100	21 41	10 10	126 331	85	15	2.62	Agreed

In Table 1 above, the 3.10, and 1.92, mean rating of items no. 2, and 3, reveal that to a high extent, there are ICT/Computer establishments in Yobe State. But these establishments are not equipped with the latest ICT/Computer equipments. This is further supported by the 2.62 mean rating of item no. 4 which shows that majority of the students were involved in typesetting and photocopying of documents which is the work mostly done in computer Business Centers.

Table 2: Distribution of the Type of Organization, Company or Outfit for SIWES

S/N	Type of Organization	No. of Respondents	% of Respondents.
1.	Computer Business Center	60	47.62
2.	Computer Training School	30	23.81
3.	Tertiary/Post-Primary School	12	09.52
4.	Telecom Company i.e. MTN, GLO, etc.	02	01.59
5.	ICT/Computer Networking/Engineering Co.	06	04.76
6.	Bank/Finance House	02	01.59
7.	Other Establishments	14	11.11
TOTAL		126	100

Table 2 revealed that 47.62 % of the total number of students did their SIWES in a Computer Business Center. Also, 23.81% of the total number of respondents among others did their SIWES in a Computer Training School. The rest of the thirty-six (36) respondents which altogether amount to 28.57% did their SIWES in various other organizations. This means that the majority of the SIWES students did their SIWES in Computer Business Centers. The result of data analysis in Table 2 supports the one in Table 1.

Table 3: Distribution of the Primary Duties of Students on SIWES

S/N	Duties involved in SIWES	No. of Respondents	% of Respondents
1.	Teaching	19	15.08
2.	Typesetting/Photocopying Documents	79	62.70
3.	Selling Computer Accessories	02	01.59
4.	Financial Transactions	08	06.35
5.	Software Installation/Computer Repairs	25	19.84
6.	Networking Computers	25	19.84
7.	Others	07	05.56

Table 3 reveals that 79 respondents which amount to 62.70% out of the 126 students were involved in typesetting and photocopying of documents in their SIWES place. This percentage represents majority of the SIWES students. This further agrees to the interpretation of the data in Table 1.

Consequently, the whole data analysis above, answer Research Question 1. To a high extent there are ICT/Computer establishment in Yobe State. However, these establishments are without the latest ICT/Computer facilities because they are mainly Computer Business Centers where the students are involved mainly in typesetting and photocopying of documents.

Research Question 2

Why do students find it difficult to secure placement in Government and private parastatals that work with the latest state of the arts facilities in Computer Science?

Table 4: Frequency, percentage and mean distribution of the rating of the SIWES students’ level of agreement on the items evaluation o why students find it difficult to secure placement in Government and private parastatals that work with the latest state of the arts facilities in Computer Science.

5.	The place of my SIWES is a Government establishment.	21	11	35	59	126	48	52	1.95	Disagreed
6.	I secured my SIWES placement by personal Effort.	57	18	16	35	126	81	19	2.77	Agreed
7.	There was no condition for my acceptance in the SIWES place.	43	25	40	18	126	72	28	2.74	Agreed
8.	I was rejected in at least 1 place before I secured this placement.	49	15	09	53	126	77	23	2.48	Disagreed
9.	I had already secured placement before the SIWES started.	72	25	21	08	126	88	12	3.28	Agreed

From Table 4, the mean ratings of 1.95 and 2.77 for items no. 5 and 6 reveal that most of the students did not do their SIWES in government establishments whereas majority of the students secured their placements by personal efforts. More so, the mean ratings of 2.74 and 2.48 of items no. 7 and 8 showed that the students were not given any condition for their acceptance in the SIWES place and also were not rejected at all before they secured their placement.

Table 5: Conditions for Acceptance of SIWES Students by the Organizations

S/N	Conditions for Accepting SIWES Student	No. of Respondents	% of Respondents
1.	If SIWES would be More than Six Months	11	08.730
2.	If Able to Pass Aptitude Test/Exam/Interview	18	14.286
3.	If Student can Work with Some Computer Packages	25	19.841
4.	No Condition	72	57.142
TOTAL		126	100

Table 5 reveals that 57.14% of the respondents were not given conditions for their acceptance in their SIWES place. However, 42.86% of the total respondents agreed that they were given one condition or the other to fulfill before they could be accepted in their SIWES place.

Table 6: No. of Places SIWES Student was Rejected before Getting Placement

S/N	No. of Places Student was Rejected	No. of Respondents	% of Respondents
1.	1 Place	35	27.78
2.	2 Places	17	13.49
3.	3 and Above	09	07.14
4.	Nil	65	51.59
TOTAL		126	100

Table 6 reveals that 51.59% of the SIWES students agreed that they were not rejected at all before they secured SIWES placements. On the other hand, 48.41% of the SIWES students agreed that they were rejected at least in one place before they finally secured placement.

The results of the whole data analysis above answer Research Question 2. Though many of the students were not rejected or asked to fulfill any condition before acceptance in their SIWES places, some reasonable numbers of students were rejected because they could not fulfill the conditions posed by their prospective SIWES organizations.

Research Question 3

Are the students really prepared for the practical challenges awaiting them in the work environment by the quality of the experience they acquire during SIWES?

Table 7: Frequency, Percentage and Mean Distribution of The Rating of the SIWES Students’ Level of Agreement on the Items Evaluation of the Students’ Preparedness for the Practical Challenges Awaiting them in the Work Environment

10.	The time I spent on SIWES was adequate for gaining much experience.	15	20	40	51	126								
		60	60	80	51	251	48	52	1.99	Disagreed				
11.	I learnt at least 3 application packages during my SIWES.	41	62	18	05	126								
		164	186	36	05	391	90	10	3.10	Agreed				
12.	I learnt at least 2 of these programming languages during my SIWES: C++, Java, VB, C#,	05	08	22	91	126								
		20	24	44	91	179	25	75	1.42	Disagreed				
13.	The operating systems I used during SIWES were Windows XP, Vista, 7 among others.	57	35	13	21	126								
		228	105	26	21	380	88	12	3.02	Agreed				
14.	I acquired experience in at least 2 of these areas: Software installation, Surfing the net, Designing web pages, Networking computers.	35	43	34	14	126								
		140	129	68	14	351	77	23	2.79	Agreed				

From Table 7, the mean rating of 1.99 for item no. 10 reveals that the time SIWES students spent on SIWES was not adequate for gaining much experience. Also, the mean rating of 3.10, 1.42, 3.02, and 2.79 for items no. 11, 12, 13, and 14 respectively showed that the SIWES students learnt some application packages and some other experiences but could not learn the latest programming languages like C++, Java, Visual Basic, C# etc. This is not adequate for a prospective computer Science student who intends to survive in the market place.

Table 8: Programming Languages SIWES Students Learnt in SIWES

S/N	Programming Languages Learnt	No. of Respondents	% of Respondents
1.	BASIC/PASCAL/FORTRAN	74	58.73
3.	COBOL	11	08.73
5.	C++/JAVA	17	13.49
6.	Visual BASIC	23	18.25
7.	C#/Oracle/Visual.Net Studio and C	00	00
8.	Nil	54	42.87

Table 8 revealed that 58.73% of the respondents learnt BASIC, or PASCAL or FORTRAN programming languages. But those who learnt the latest Object Oriented Programming languages like C++, JAVA, Visual BASIC, C# etc. formed altogether 31.74% of the respondents which is very inadequate. Also, the SIWES students who did not learn any programming language at all amounted to 42.87% of the total number of SIWES students. This is in agreement to the result of data in Table 7 above. This is quite inadequate and unacceptable.

Table 9: Hands on Experience Acquired by Students on SIWES

S/N	Experience Acquired on SIWES	No. of Respondents	% of Respondents
1.	Software/V-SAT Installation	68	53.97
2.	Surfing the Internet	19	15.08
3.	Repairing Computers	30	23.81
4.	Networking Computers	31	24.60
5.	Developing in- House Software	05	03.97
6.	Designing Web Pages	15	11.90
7.	Others	16	12.70

Table 9 reveals that apart from all other experiences acquired, only 03.97% of the SIWES students acquired experience in developing in-house software, an activity which is purely the core of Computer Science. This supports the result of data analysis in Tables 7 and 8 which revealed that the SIWES students did not learn the latest object oriented programming languages like C++, JAVA, VB, C# etc.

The results of data analysis of Tables 7, 8 and 9 answer the Research Question 3. The SIWES students are not really prepared to meet the challenges in their future work environment because they lack experience in the core computer Science activity i.e. in-house software and programming.

Discussion

The findings of the study in relation to Research Question 1 showed that to a high extent there are ICT/Computer establishments in Yobe State. However, these establishments are without the latest ICT/Computer facilities because they are mainly Computer Business Centers where the students are involved mainly in typesetting and photocopying of documents. This is not enough experience for a prospective computer science career man. These findings are consistent with the result of Olugbenga (2009) who reported that the place of SIWES of some of the respondents in his research work lacked adequate modern facilities and personnel.

Referring to Research Question 2, findings showed that though many of the students were not rejected or asked to fulfill any condition before acceptance in their SIWES places, some reasonable numbers of students were rejected because they could not fulfill the conditions posed by their prospective SIWES organizations. We therefore conclude that many of the Students found it difficult to secure placement in Government and private parastatals that work with the latest state of the arts facilities in Computer Science due to the conditions they were asked to fulfill which they could not. This gives credence to the work of Wodi and Dokubo, (2009) who reported that difficulties of students in getting placement, among others were areas of weaknesses revealed.

For Research Question 3, the results of the study showed that the SIWES students are not really prepared to meet the challenges in their future work environment because they lack experience in the core computer Science activity i.e. programming and developing in-house software. This means that any student that lacks the knowledge of at least 2 Object Oriented Programming languages like Java, C++, Visual Basic, C# and Visual.Net Studio is not prepared to meet future pragmatic challenges. The short time many of the students stayed on SIWES as a result of securing placement late might partly have made it difficult for them to gain adequate experience or the lack of personnel or adequate software facilities in their SIWES places. This findings support the work of Ugwuanyi and Ezema (2010), who asserted that the new development in ICT environment poses a challenge to educators, practitioners, and students, in the following aspects: Digital Environment, New career specializations, information services and transformation of some specialized subject areas.

Conclusion

The study revealed that there are ICT/Computer outfits in existence in Yobe State but these outfits are mainly Computer business centers and Computer Training Schools in which students acquire mainly skills of typesetting and photocopying documents. This is grossly inadequate. Also, the students find it difficult to secure placement due to conditions given by these ICT/Computer organizations. However, if the skill acquisition centers are built by institutions in Yobe State and equipped with the latest ICT/Computer state of the art facilities and students are made to pass through this strict skill acquisition during the end of semester holiday before they proceed to their SIWES, the needed basic practical skills will be acquired by the students.

By so doing, SIWES will be re-structured and hence Computer Science Education re-engineered for employment and productivity of prospective Computer Science graduates.

Recommendations

1. In view of the finding that the existing ICT/Computer outfits in Yobe State are mainly Computer Business centers that do not have latest/modern ICT/Computer facilities, the State and Federal Government should encourage the citizens to enter into the establishment of such ICT/Computer outfits for profit and by so doing create opportunities for our Computer Science students to acquire up to date experience during SIWES.
2. It was also noted that many students were given conditions like ‘if they can work on the system with some packages’, or if period of SIWES will be more than six months before they could be accepted. This means that basic practical knowledge is needed by these organizations for accepting SIWES students. Hence, it becomes imperative that alternative measures should be taken by various institutions to overcome the practical inexperience of many prospective SIWES students. This could be achieved by building standard ICT/Computer skill acquisition Centers different from our normal lecture ‘theoretical’ computer science laboratories. This Skill acquisition centers would be composed of all the relevant aspects of computer science. The student would be made to undergo this training during any of the end of semester holiday before they proceed for SIWES. The experience acquired would make them important to their prospective SIWES employers. As they work for them, they acquire more skills. If SIWES is re-structured in this way, then the entire Computer Science Education would be re-engineered for employment and productivity of prospective Computer Science graduates.
3. To ease the endless search for placement, students should embrace this re-structuring scheme suggested above with diligence and also take time to embark on practical projects on their own. This will make them bold and give them self confidence in their place of SIWES.

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