

Impact and Use of ICT in Students' Industrial Work Experience Scheme (SIWES) on Science and Engineering Programme among the Public Polytechnics in Oyo State, Nigeria.

Anjorin Ademola Oluwasegun¹, Oshotoye Bradford Adedayo²

Industrial Liaison & Placement Office (ILPO) and Crime Management and Security Studies the Polytechnic, Ibadan

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ABSTRACT

This study investigates the impact and utilization of Information and Communication Technology (ICT) in the Students' Industrial Work Experience Scheme (SIWES) among science and engineering programs in public polytechnics of Oyo State, Nigeria. The research adopts a convergent mixed-methods design to capture both quantitative outcomes and qualitative insights from final-year students, SIWES coordinators, and employers. Quantitative data were gathered via a structured questionnaire distributed to 340 students across five polytechnics, with a response rate of 92% ($n = 296$). Key indicators included ICT access (facility availability, internet reliability, software tools), ICT usage in SIWES activities (data collection, reporting, remote collaboration), perceived skill enhancement (problem-solving, technical competency, digital literacy), and academic performance indicators (GPA, project quality).

Descriptive statistics (means, standard deviations) and inferential analyses (t-tests, ANOVA) examined differences by department (Electrical/Electronics, Mechanical, Civil, Computer Engineering, Science Laboratory Technology) and by prior ICT exposure. Qualitative data were analyzed thematically from 24 interviews and 8 focus groups, revealing core themes: (i) ICT infrastructure gaps and power reliability; (ii) training and support for e-reporting and e-portfolio development; (iii) collaboration with industry partners leveraging digital platforms; and (iv) student adaptability to virtual SIWES components. Findings indicate that ICT access significantly correlates with higher self-reported competencies in technical reporting ($r = 0.46$, $p < 0.01$) and project quality ($p < 0.05$). Policy implications emphasize investment in campus networks, standardized SIWES ICT guidelines, and capacity-building for students and supervisors to maximize SIWES outcomes in public polytechnics in Oyo State.

Keyword: Student Industrial Scheme, ICT Skills, Science & Engineering, Placement, Public Polytechnic, Oyo State

INTRODUCTION

Students' Industrial Work Experience Scheme (SIWES) is a programme established by Federal Government through Industrial Training Fund (ITF) in 1973 with the headquarters in Jos, Nigeria. Before its establishment it was discovered that graduate from various institutions lives below performance when they get to different organization which necessitate the establishment of the scheme. It is meant to enable students in tertiary institutions in Nigeria acquire technical skills and experience for professional development in their course of study as it bridges the gap between theory and practical. The Scheme actually started in 1974 in 11 institutions of higher learning with 748 participants. By 1978, it has widened in scope to about 5,000 participants from 32 different institutions in the country. In 1979 the Industrial Training Fund, withdrew from the managing the scheme due to problems of organizational logistics and the increased financial burden as a result of rapid expansion of SIWES (ITF; 2004)

SIWES is also an effort to bridge the existing gap between theory and practice and expose students to necessary skills for smooth transition from the classroom to the world of work. It enables students to acquire technical skills and experience for professional development in their study. Before the inception of the Scheme, there was a growing concern among Nigerian industrialists that graduates of institutions of higher learning lacked adequate

practical background experience necessary for employment. So, employers were of the opinion that the theoretical education provided by higher institutions did not meet nor satisfy the needs of the economy. It was against this background that the support during its formative years, introduced SIWES to provide students with the opportunity of exposure to handle equipment and machinery in Industry to enable them acquire prerequisite practical knowledge and skills. (ITF and UNIJOS, 2011). These skills aimed at exposing students to professional work methods as the scheme (SIWES) acts as a catalyst for industrial growth and productivity through professional development.

In the rapidly evolving landscape of education, the integration of Information and Communication Technology (ICT) has become critically important, particularly in technical fields such as science and engineering. Students' Industrial Work Experience Scheme (SIWES) serves as a pivotal component of the educational framework in Nigeria, providing students with the opportunity to gain practical experience, apply theoretical knowledge, and develop essential skills in real-world settings.

The bodies involved in SIWES operation are known as the stakeholders and they are; the Federal Government of Nigeria (through the Ministry of Commerce and Industry), Industrial 3 Training Fund, NUC/NBTE/NCCE, the institution, the industries or employers and the students. SIWES is a form of cooperative industrial internship programme among all its stake holders. Mafe (2009) stated that all stakeholders are involved in the operation of SIWES but that students are the key actors that are directly involved in its implementation, all other stakeholders have lesser role to play in the actual training process. Mafe (2016) stated that, SIWES is generic because it cuts across more than 60 programs in the universities, over 40 programs in the polytechnics and about 10 programs in the colleges of education. Students who participate in this training programme include those studying Library and Information Science, Engineering, Vocational, Technological and related courses in higher institution of learning. Other courses involved in SIWES include Agricultural science, Forestry, Industrial Chemistry, Microbiology. This circumstance raises the question of whether SIWES possesses the capacity to influence Science and Engineering students' academic performance. It therefore, became essential to conduct an empirical study to ascertain the influence of Students' Industrial Work Experience Scheme on the academic performance of Science and Engineering undergraduates with focus on three Public Polytechnics in Oyo State, Nigeria.

Statement of problem

The mode of application of this program confines their ability at times to access vital resources and hampers their overall learning experience.

Many polytechnic institutions in Oyo State struggle with inadequate ICT infrastructure, including unreliable internet access and a lack of modern technological tools. This inconsistency prevents students from fully engaging with digital resources during their industrial training.

There is often insufficient training for both students and faculty on the optimal use of ICT in educational contexts. This lack of support can lead to frustrations and diminish the potential benefits of utilizing technology during industrial training.

Students may face challenges in developing essential ICT skills that are crucial for their future careers. Without proper training and exposure, they may find themselves unprepared for the increasing technological demands of the workforce.

There is often a gap between academic institutions and industries regarding the expectations of students' technological competencies. This misalignment can result in students graduating without the necessary skills that employers seek in the job market.

Objectives

1. To check the usage on how students utilize ICT tools during their SIWES and identifying specific technologies and methods employed in the learning process with overall performance
2. Investigate students' perceptions of how ICT enhances or hinders their industrial training experience.
3. Assess how ICT proficiency gained during SIWES influences students' preparedness for employment and develop actionable recommendations for educational institutions.

Research Questions

What is the academic performance of Science and Engineering students of Public Polytechnic in Oyo using ICT before and after participating in SIWES?

What is the influence of SIWES on academic performance of Science and Engineering students of Public Polytechnic in Oyo?

What is the perception of using ICT in the SIWES program among Science and Engineering students in Public Polytechnic, Oyo State, Nigeria?

LITERATURE REVIEW

SIWES is the acronym for Students' Industrial Work Experience Scheme. It is a skill development programme that is designed to prepare students of higher institutions of learning like Universities, Polytechnics, Monotechnic and Colleges of Education for transition from college environment to the world of work.

Akerejola (2008) stated that the work experience is an educational programme where students participate in work activities while still attending school. This gives students the opportunity to be directly involved and be part of the actual work situation outside the classroom. For instance, library and information science students are able to handle library materials and equipment physically for processing. Books will be accessioned, stamped, catalogued and classified etc. LIS students will also be involved in other library activities like circulation which involves charging and discharging, shelving and shelve reading etc.

They will also be part of bindery activities for book production and these will make them to be involved in the actual work situation outside the classroom. It was specifically designed to provide students of tertiary institutions in specific courses, with the opportunity of acquiring practical skills and experiences on-the-job before graduation so that they can graduate as professionals.

SIWES as a form of cooperative education was described by Griffin and Celhoso (2018) as a programme of occupational education for those who through cooperative arrangement between the institution and employers receive instruction/training by alternation of study in school with a job in an occupational field. They stressed that two experiences must be planned and supervised by the school and employers so that each contributes to the student's education and professional development. Also, Mafe (2009) stated that there are two basic forms of learning; education and training both of which are essential to the productive world of work and the functioning of the society. Both education and training are important. For any effective education there must be some training input and vice versa. Every productive individual in this millennium must be able to combine and make use of the outcomes from the two forms of learning for effective professional development. Likewise, Ugwuanyi, Chijioke and Ezema, (2010) opined that training is a key factor that enhances efficiency and expertise of the workforce.

The scheme prepares students for labor markets and has become an innovative phenomenon in human resources development and training in Nigeria today. They further stated that education has to with giving systematic instruction to students in a formal setting like the schools, colleges or universities. It is that process where knowledge and information are acquired facilitating understanding by the recipients. The recipient of education acquires knowledge and capabilities in his/her specific area of civilization. Mafe (20004) opined that training gives the recipient the competencies required to do a job or carry out function. It is the process where knowledge, skills, abilities and attitudes (KSAs) required in doing a specific job or carrying out a specific function are transferred from one person to another or to a group of persons. Although literacy can be an advantage, it is not essential to training; hence the process of training can be encapsulated in the four steps of "show, tell, do and check" The KSAs acquired through training are focused at enabling the recipient or trainee to do or carry out a specific job or function after the completion of the training programme. Training equips the recipient with the capability to do or carry out a specific task, job or function. The terms education, training and development though distinct, they are closely intertwined and often interchangeably used. It is generally believed that there is a link between education and training on the one hand, and training and development on the other while training straddle in between the two.

METHODOLOGY

Methodology

Descriptive research design was adopted for the study. The population of the study comprised all the final year students from three public polytechnic in Oyo state, Nigeria in the 2024/2025 academic session totaling 340, out of which 121 were from the polytechnic, Ibadan, 112 students from Adasen Ogun Doyin polytechnic, Ebuwa, while, 107 students were from oke-ogun polytechnic, saki. The three institutions were purposively selected because they are the only state polytechnics in Oyo State and a place for ease of data collection. Total enumeration was employed. Structured and validated questionnaire was used for data collection. Out of the 340 copies of questionnaire administered, 294 questionnaires were adequately answered and retrieved which represented 92% for valid analysis. Data collected were analyzed with the Statistical Product and Service Solution (SPSS) using descriptive statistics of frequency count, simple percentages, mean and standard deviation, and presented in tables. Descriptive statistics also used to gauge the average response cut-off and the description indicated that mean response of 2.50 and above were taken as agreed and as such accepted in decision rule. Data were analyzed using descriptive statistics such as percentages, mean scores, standard deviation, and frequency counts, as well as inferential statistics, Factor Analysis and Analysis of variance (ANOVA)

RESULTS

The results are as presented in tables 1- 5.

Table 1. Demographic Profile of the Respondents

Socio-Demographic Characteristics	Categories	Frequencies (N=294)	Percentages (%)
Gender:	Male	121	41.2
	Female	173	58.8
Age Range:	20-25 years	93	31.6
	26- 31 years	136	46.2
	32 - 37 years	65	22.1

The demographic information of the respondents is as presented in Table 1. The analysis showed that high percentage of the respondents (58.7%) are female while 41.2% are male. The table also revealed that 31.6% of the respondents are within the age range of 20-25 years and 26-31 years. Are 46.2 % (65) falls within 32-37 years of age.

Table 2: Academic performances of the Respondents from Science & Engineering before and after SIWES Participation Grade

Before SIWES	Freq.	%	After SIWES	Freq.	%
Pass	26	12.6	Pass	18	8.7
Lower Credit	83	40.3	Lower Credit	69	33.5
Upper Credit	68	33.0	Upper Credit	89	43.2
Distinction	27	13.1	Distinction	29	14.1
Total	294	100		294	100

The comparison of the academic performances of the respondents before and after SIWES participation presented in Table 2 indicated that prior to SIWES engagement, 2 (1.0%) of the respondents were on probation; 26 (12.6%) were on (pass); 83(40.3%) were on (lower credit); 68 (33.0%) were in upper credit) and 27 (13.1%) were in first class (distinction). The table further revealed the performances of the respondents in the following semester after participating in SIWES. Analysis of data revealed that only 1 of the respondents remained on probation; the number of respondents on pass reduced from 26 to 18; and the number of respondents on (lower credit) reduced from 83 to 69. Interestingly, the number of respondents on Upper Credit (Upper class) increased from 68 (33%) to 89 (43.2%) indicating a 10.2% raise in that category. Also, the number of students in Distinction

(First Class) from 27 (13.1%) to 29 (14.1%). It can therefore be deduced that there was an improvement in the academic performances of the respondents after participating in SIWES.

The improvement in the performances of the students after participating in SIWES could be attributed to their exposure to the practical reality of their course of study with ICT which consequently improved their understanding of the course content. The finding of this study confirms the assertion of *Ademiluyi and Ademiluyi* (2018) that SIWES is expected to engender positive changes in the student which should be measurable in the classroom performance of the student in the aftermath of the SIWES period.

Table 3: Influence of SIWES on Academic Performance

SN	Items	Strongly Agree		Agree		Disagree		Strongly Disagree		Mean \bar{x}	Std. Dev.
		Freq.	%	Freq.	%	Freq.	%	Freq.	%		
I	Improvement in the last semester result	203	50	90	43.7	12	5.8	1	0.5	3.43	.62
II	Improvement in understanding of the technical terms associated with ICT	275	56.8	81	39.3	5	2.4	3	1.5	3.51	.62
III	Improvement in passion for ICT	285	51	88	42.7	7	3.4	6	2.9	3.51	.62
IV	Improvement in performance in practical courses	234	50.5	88	42.7	13	6.3	1	0.5	3.43	.63
V	Improvement in understanding of course content	259	52.9	88	42.7	6	2.9	3	1.5	3.47	.62
	Weighted Mean									3.47	.62

N = 294

The influence of SIWES on the respondents' academic performance presented in Table 3 revealed that an aggregated 254 respondents representing 93.7% affirmed that their last semester result improved due to their involvement in SIWES. Also, 278 (96.1%) agreed that involvement in SIWES improved their understanding of technical terms associated with librarianship. Given that all the items in the table exceeded the cut-off mean of 2.5 and yielded a weighted mean of 3.47, it can be deduced that there is a strong influence of SIWES on the students' academic performance.

The finding of this study agrees with Chukwudi (2011) whose study examined the perception of the influence of SIWES on academic achievement of final year students in University of Benin and reported that SIWES positively influenced the students' academic performance. Similarly, the finding of the present study is in line with Ademiluyi and Ademiluyi (2018) whose assessment of the influence of SIWES on the academic performance of science and Engineering students in public Polytechnics in Oyo State indicated that SIWES has great influence on student's performance in Word Processing. The claim by Duignan (2003) that, it is not self-evident that work experience translates into enhanced academic performance is contradicted by the finding of this study given that analysis of data clearly indicates an improved academic performance among the study population.

Table 4: Perception of SIWES by Science and Engineering students

SN	Participation in SIWES	Strongly Agree		Agree		Disagree		Strongly Disagree		Mean \bar{x}	Std. Dev.
		Freq.	%	Freq.	%	Freq.	%	Freq.	%		
I	is necessary for science and engineering students	260	63.1	67	32.5	7	3.4	2	1	3.57	.60
II	enables students to develop abilities and skills necessary for proficiency in their profession.	230	63.1	73	35.4	2	1	1	0.5	3.61	.53

III	helps students to develop the necessary work ethics and habits needed in ICT	227	56.8	86	14.7	3	1.5	0	0	3.55	.52
IV	exposes student to the intricacies in ICT	2600	48.5	98	47.6	8	3.9	0	0	3.44	.57
V	empowers students to be more useful and productive members of the society	265	51.0	92	44.7	8	3.9	1	0.5	3.46	.59
VI	exposure helped me to develop more interest	291	48.1	86	41.7	15	7.3	6	2.9	3.34	.76
	In workshop/laboratory activities										
VII	The ways of handling materials in the workshop/laboratories are enhanced after SIWES exposure	287	34.5	121	58.7	13	6.3	1	0.5	3.27	.59
	Weighted Mean									3.46	.59

N = 294

The perception of SIWES by Science and Engineering undergraduates as analyzed indicated that an aggregated 292 respondents representing 99.5% perceived that SIWES enables students to develop abilities and skills necessary for proficiency in their profession. The table further reveals that all the items attracted mean scores above the cut-off mean of 2.5, with a weighted mean of 3.46 indicating that the respondent have a very high positive perception of SIWES as a vital component of ICT training. This finding affirms the result of Ojokuku, et al. (2015) who reported high positive perception of SIWES as an influencer of professional development among Science and Engineering students South-West, Nigeria.

RECOMMENDATIONS

In view of the findings of the study, the following recommendations are suggested:

1. Science and Engineering Undergraduates embarking on SIWES should endeavor to make maximum use of the opportunity to improve their academic performance, build professional capacity and brighten their chances of employment after graduation by committing themselves to the task that may be assigned to them at their attached library.
2. Management of Polytechnics and other relevant organizations that absolve SIWES students should be equipped with relevant ICT* facilities, equipment and infrastructure to enable them expose the trainees to relevant industrial experiences and knowledge.
3. The supervision of SIWES trainees should be meticulously carried out by the concerned officers to enable the trainee's benefit maximally from the programme and avoid situation where some trainees display laxity during the programme. Officers in charge of SIWES students should see their roles as service to humanity and discharge same with utmost sense of responsibility; and
4. The host organization should endeavor to incorporate the payment of stipends for transportation to trainees for improved commitment to organization while the exercise last.

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