



Impact of Quality Assurance Measures on Students' Performance in Refrigeration and Airconditioning Works in Technical Colleges in Southwest, Nigeria

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

This study was designed to assess students' productivity in refrigeration and air conditioning works as correlate of quality assurance measures in technical colleges. The study adopted a survey research design. The population for the study was all 223 refrigeration and air conditioning (R&A) works students in state owned technical colleges in south west Nigeria. One research questions and three hypotheses tested at 0.05 level of significance guided the study. The instruments used for data collection was the Quality Assurance (QA). The QA instrument developed by the researcher, has a total of 34 items. The sample for the study was all 150 year two and three refrigeration and Air conditioning students in the state owned technical colleges in south west Nigeria. The trial test of the instrument was carried out on 10 technical college R&A students who are not part of the study. Face and content validity were carried out on the structured questionnaire

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by three specialists in test construction. The reliability coefficient computed for the QA with the use of the Cronbach Alpha was 0.79. Mean and standard deviation were used to answer the research questions. The study revealed a positive impact of curriculum implementation as an indices of Quality Assurance Measures but however observed a no-adequate and negative impact of physical and infrastructural facilities as available in the colleges among other findings. The study thereafter recommended that in-service teachers should be given training in developing and using continuous assessments through refresher courses and that philanthropist and alumni associations of the colleges be attracted to support the schools with relevant learning facilities such as laboratory, workshop, furniture and equipment among other recommendations.

Keywords: Refrigeration and Air conditioning works; technical colleges; students; quality assurance measures.

1. INTRODUCTION

Refrigeration and air conditioning work (R&A) is one of the mechanical trade offered in technical colleges in Nigeria. The purpose of this program is to prepare students for employment in the heating, air-conditioning and refrigeration industry. The program focuses on broad, transferable skills and stresses the understanding and demonstration of entrepreneurship knowledge as required in the industry. The skill in R&A involves the application of scientific knowledge and practical skill. The goal of R&A among others according to the National Board for Technical Education NBTE [17] is to equip the trainee with the knowledge and skill that will enable him/her carry out basic repairs and maintenance on domestic, commercial and transport refrigeration and air conditioning systems.

Air conditioning technology is constantly advancing in response to the 21st century demands. It is one industry that has continued to experience constant changes and improvement. The current trends indicate that air conditioning units now have good filtration systems that help to get rid of pollutants that reduce indoor air quality, including debris, dust, dirt or other contaminants and even remove bad odours, bacteria and viruses. Air conditioning are also now wi-fi controlled. Many modern air conditioning units now allow the system to be controlled remotely via a smartphone or a device that is connected to the internet. Artificial intelligence (AI) is also vigorously creeping into refrigeration and air conditioning manufacturing. Thus, AI provide opportunities to improve energy savings and comfort, as well as maintenance, by predicting when a repair is needed. Systems fitted with AI will also be able to sense the room temperature and turn on when needed, or go on sleep mode if there is no one in the room.

Dynamism in R&A technology, evidenced in the production of these hybrid sensitive gargets has necessitated the effective training and re-training of craftsmen who will handle their maintenance. This is very necessary to keep trend with maintenance requirement of today's R&A systems. An ill-maintained refrigerator or air conditions can lead to wastage of both life and valuable properties. Effective training of competent R&A mechanics by the relevant technical colleges is very important.

The programmes in technical colleges in Nigeria are offered at levels leading to the award of National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC) for craftsmen and master craftsmen respectively [1]. In order to achieve uniform and effective manpower training, a national curriculum is adopted in all the Technical College programmes accredited by the NBTE. The main feature of the curricular activities for the Technical Colleges (R&A works inclusive) are structured in foundation subjects and trade modules, the curriculum for each trade consists of general education, small business management and entrepreneurial training, theory and related courses, workshop practice and industrial training components (Federal Government of Nigeria (FGN) [1].

Furthermore, in order to achieve the objective of effective training of competent R&A Technicians, government at both the federal and state levels expended huge amount of money on the procurement of equipment for use in the technical colleges. In the same vein, such effort like curriculum review, policy shift, re-training, and production of technical college teachers by the government to ensure qualitative education at the technical colleges and bring about high quality products both in academics and for employment have not yielded much dividend. This is because the skill gap among graduates of

technical and vocational education in general and R&A graduates in particular has resulted in absence of entrepreneurs and master craftment among graduates. This is evident in the graduates not possessing the requisite technical and entrepreneurial skills as most of them join the huge numbers of unemployed persons' who later indulge in unskilled labour such as commercial motor cycling popularly called 'Okada' or 'Asama' in Nigeria. The problem of this study therefore, is that technical college R&A work students graduate with little appreciable requisite skills needed to function properly at workplace. One probable cause of this misdemeanour according to Yangben and Seniwoliba [2] might be associated with inadequate quality assurance measures of R&A program.

Quality assurance can be described as the processes and procedures that systematically monitor different aspects of a service, process or facility to detect, correct and ensure that quality standards 'are being met. Quality assurance helped us to eliminate defective products and increase customer satisfaction [18]. Maduwesi and Onyeachu [19] view quality assurance as a process of ensuring that good standard is ensured. Quality Assurance measures refers to the specific strategies or internal and external measures undertaken by monitoring bodies of tertiary institutions in Nigeria to meet the minimum standard expectations of the regulatory bodies.

Quality Assurance measures refers to the specific strategies or internal and external measures undertaken by monitoring bodies of various institutions in Nigeria to meet the minimum standard expectations of the regulatory bodies. It can also be viewed as the process developed and adopted by monitoring bodies of institutions in Nigeria to ensure that quality delivery in the system is maintained and adhered to.

Accordingly NBTE [20] stipulated guidelines for quality Assurance measures expected to be put in place in technical colleges to ensure quality educations to include; provisions of adequate physical facilities, effective curriculum implementation and regular assessment/evaluation among others.

1.1 Educational Physical Facilities

Educational facilities are material resources that enhance teaching and learning thereby

making the process meaningful and purposeful. According to Atolagbe [3] school facilities are the physical enablers of teaching and learning which will increase the production of results.

According to Yangambi [4], facilities include buildings, grounds, utilities, equipment and will typically represent the majority of an entity capital asset. The lack of adequate infrastructures in our institution of learning has posed serious setback in the achievement of the much desired technological breakthrough. In institution where there are no adequate classrooms, resource rooms, laboratory facilities, workshop facilities and the like; proper teaching and learning cannot be effective and efficient in the system. Onyebuenyi, Onovo, Ewe, & Njoku [5] in their study titled Impact of School Physical Facilities on Students' Academic Performance in Senior Secondary Schools in Aba Education Zone of Abia State concluded that, there is significant difference in the performance of students in institutions with adequate facilities and those with inadequate facilities. The lack of good buildings and funds to rehabilitate collapsed structures poses threat to the system performance and its sustainability. Hence, education to some extent is may be falling due to low standard.

1.2 Assessment & Evaluation and Students' Practical Skill Acquisition

In the aspect of assessment and evaluation, Technical colleges are expected to ensure that there is regular conduct of continuous assessment in the form of formative evaluation which is expected to be cumulative before the final examination tagged National Technical Certificate (NTC) examination conducted by The National Business and Technical Education Board (NABTE). They are also expected to ensure that the examinations system provides for adequate redress in case of alleged unfair non-transparency. Assessment scores are expected to be accessible to the students and their examinations results are timely moderated and released as at when due.

1.3 Curriculum Implementation

Accordingly, dey and Opoh [6] opined that curriculum implementation can be viewed as the actual engagement of learners with planned learning opportunities. It is the actual carrying-out of societal culture and/or government policies

and activities as spelt out in the curriculum The successful implementation of a curriculum to a large extent is determined by teachers It has been pointed out that teachers may be deficient in curriculum policy implementation due to a number of factors such as; their entrenched beliefs, negative attitudes, inappropriate or inadequate skills and knowledge and lack of available resources at the local levels as they may recognize change and innovation but refuse to implement it Erica, Chris and Sunddip [7].

The need to ascertain the impact of quality assurance measures such as provisions of adequate physical facilities, effective curriculum implementation and regular assessment and evaluation as practiced in technical colleges on R&A program in southwest Nigeria is the focus of this study.

Specifically, the study sought to ascertain the impact of

1. curriculum implementation of R&A program
2. Physical Facility for the implementation of R&A program
3. Assessment and evaluation for the implementation of R&A program

1.4 Research Questions

1. What is the status of curriculum implementation of R&A program in technical colleges in southwest, Nigeria?
2. Do Physical Facilities available in the colleges for the teaching of R&A program impact positively on students' performance?
3. Do assessment and evaluation of R&A program carried out in the colleges' impact positively on performance of students?

The study was delimited to technical colleges in south west Nigeria. It was also delimited to curriculum implementation, physical facilities and assessment and evaluation of students only as it relates to quality assurance measures of students' productivity.

2. METHODOLOGY

A descriptive Survey design was used for the study. The study was carried out in all the state owned seven (7) Technical Colleges offering

R&A in south west Nigeria. These colleges includes; Government Technical Colleges at Ado Ekiti (Ekiti State), Osobgo (Osun State), Idi Aba Ogun (State), Agidingbi (Lags State), Ikotun (Lagos State), Ikorodu (Lagos State), and Owo (Ondo State). The population consists of all 223 R&A students in the colleges. The samples for the study consist of all 150 year two and three students offering R&A in all the aforementioned colleges. The instrument used for data collection was a 34 item structured questionnaire tagged Quality Assurance (QA) Questionnaire. The QA was a 4 point modified rating scale of Strongly Agree (SA); Agree (A); Disagree (D) and Strongly Disagree (SD) developed by the researcher.

The questionnaire was divided into four sections, A to D. Section A sought information on personal data of the respondents. Section B sought information on curriculum implementation of R&A program as implemented in the colleges. Section C sought information on the suitability of physical Facilities available in the colleges for the implementation of R&A program. Section D sought information on assessment and evaluation of R&A program as practice in the colleges.

The questionnaire was developed by the researcher and validated by three specialists in test construction for the establishment of its face and content validity. The comments and suggestions of the experts were incorporated in building up its final draft.

The instrument was thereafter administered to ten (10) R&A students in a Technical College that is not involved in the study. After two weeks interval, the instrument was re-administered to the same students. The Pearson Product Moment Correlation coefficient obtained was 0.74. Thus the instrument was suitable for the study. The questionnaires were administered on the respondents through the help of seven research assistants. A total of 147 questionnaires were properly filed and returned. The data collected was analyzed by the use of Mean, Standard Deviation. A questionnaire items with mean rating of 2.5 and above on the four-point scale was accepted and thus indicated that the respondents agreed with the item on the questionnaire while a mean of 2.49 and below indicated that the respondents disagreed with the item on the questionnaire. The 2.50 cut off point were derived from the sum of nominal values assigned to the scaling items responded

to by the respondents divided by number of respondents (N) that responded to the items.

3. RESULTS

The result of the research questions 1

Data presented on Table 1 indicated that the respondents were in agreement with only five out of the thirteen items. Thus the five items that had their mean above 2.50 were adjudged by the respondent as having positive impact on R&A students' performance while the remaining seven received negative responses with mean below the cut off mean of 2.5.

From Table 2, the mean ratings of all items by the respondents were below the mean

cut-of point of 2.50 as the respondents disagreed with all ten statements. Thus the respondents are of the opinion that physical facilities and learning equipment in the colleges do not encourage positive academic performance.

Table 3 above shows that the respondents agreed to only four of the items this includes items 1, 7, 10 and 11. They therefore disagreed to seven (7) of the items, these are 2, 3, 4, 5, 6 and 8. It has a grand mean of 2.47. This is below the cut off mean. It is thus indicative of the fact that the respondents do not believe that the mode of assessing and evaluating R&A in the technical colleges encourages positive academic performance.

Table 1. Mean and standard deviation ratings of respondent on the impact of curriculum implementation on R&A program

S/N	N=147			
	CURRICULUM IMPLEMENTATION	\bar{X}	SD	Decision
1	R&A instructors and teachers attend promptly to their lessons	2.51	0.57	Agree
2	there are adequate teachers and instructors to teach various R&A trade subjects in my school	2.21	0.78	Disagree
3	Students are taught enough practical to make us self-reliant after graduation	2.37	0.06	Disagree
4	Text books in R&A are made available to students Especially in the library	2.19	0.41	Disagree
5	Instructors and teachers teaching R&A trade Subjects do exhibit high knowledge of the subject they teach	2.57	0.33	Agree
6	methods of teaching adopted by R&A teachers encourages students high academic performance in R&A	2.50	0.51	Agree
7	Content of what students are being taught conform to latest reality in R&A discipline.	2.51	0.62	Agree
8	students are being taught the intricacy of fault diagnosis with the use of ICT equipment	2.02	0.16	Disagree
9	Most often, external inspectors do monitor Academic Activities in our school	2.48	0.81	Disagree
10	The school management team always monitor academic activities in my school	2.56	0.93	Agree
11	R&A students are sent for SIWES program where they are taught practical	3.33	0.36	Agree
12	R&A classes are not overpopulated in my school	3.57	0.96	Agree
13	Incessant transferring of R&A teachers is not a contributing factor for students not learning R&A	2.74	0.85	Agree
Grand Mean		2.50		

Key N=numbers of the respondents, X = mean of the respondents, SD = standard deviation of the respondents
R&A= Refrigeration and Air-conditioning

Table 2. Mean and standard deviation ratings of responses of respondent on the impact of physical facilities available in the colleges on R&A program

S/N	N=147				
		PHYSICAL AND INSRUCTIONAL FACILITIES	X̄	SD	Decision
1	R&A trade in my school have a standard workshop building		2.39	0.45	Disagree
2	R&A trade workshop are well equipped with adequate tools and facility for practical exercise		2.41	0.82	Disagree
3	There are adequate safety equipment such as Standard fire extinguisher stationed in R&A department and other locations in my school		2.30	0.09	Disagree
4	There is constant electricity power supply for students' comfort and power trade equipment		2.01	0.76	Disagree
5	There is provision of ICT facilities to enhance teaching and learning of R&A in my school		2.38	0.21	Disagree
6	Adequate standard classrooms are available for R&A students		2.40	0.63	Disagree
7	There is available constant portable water supply for practical and student comfort in my school		2.36	0.32	Disagree
8	Standardized hostel accommodation are provided for all students inclusive of R&A students		2.11	0.34	Disagree
9	Most of the R&A equipment and tools available are adequate during each lessons and practical classes		2.31	0.29	Disagree
10	R&A equipment are made available to students for practical use at all official times		2.25	0.37	Disagree
Grand Mean			2.29		

Key N=numbers of the respondents, X = mean of the respondents, SD = standard deviation of the respondents
R&A= Refrigeration and Air-conditioning

Table 3. Mean and standard deviation ratings of responses of respondent on the impact of assessment and evaluation in the colleges on R&A program

S/N	N=147				
		ASSESSMENT AND EVALUATION	X̄	SD	Decision
1	R&A Instructors and teachers do take attendance of students during each lessons and practical classes		2.52	0.81	Agree
2	Assignment and homework were normally given to students at the end of all classes and practical		2.37	0.31	Disagree
3	There is regular conduct of continues assessment by R&A teacher before each terminal examinations		2.48	0.29	Disagree
4	There are no menace of examination leakages in my school		2.44	0.66	Disagree
5	Assessment and Examination scores are promptly release and assessable to all students		2.42	0.48	Disagree
6	Instructors and teachers are very fair in their assessment of students		2.47	0.85	Disagree
.7	Examination malpractice is not rampant in my school		2.61	0.91	Agree
8	Management and instructors in my school ensures good quality of examination questions		2.46	0.23	Disagree
9	R&A teachers check students notes and assignments so as to improve on their performance		2.40	0.31	Disagree
10	students' class attendance in my school Help increase their academic performance		2.52	0.63	Agree
11	Supervision of continuous assessment tests and Examinations By teachers frequently conducted in my school increases students' performance in R&A		2.50	0.90	Agree
Grand Mean			2.47		

Key N=numbers of the respondents, X = mean of the respondents, SD = standard deviation of the respondents
R&A= Refrigeration and Air-conditioning

4. DISCUSSION AND CONCLUSION

The findings of the first research question revealed a combined positive influence of teachers' attendance in classes, teachers' ability to exhibit high knowledge of the Subject, methods of teaching adopted by R&A teachers, relevant Content of what students are being taught, monitoring of academic activities by relevant authorities, students participation in SIWES program, non-over population of classes and stability in teachers posting on the implementation of R&A Curriculum in the technical colleges as perceived by the Students.

The above finding is in line with the study of Obiekezie and Timothy [8] in their study entitled Students' Perception of Teacher's Knowledge of Subject Matter and Reading Comprehension Performance of SS3 Students in Cross River State, Nigeria where it was discovered that the students who perceived their teachers' knowledge of subject matter as low had a mean score of 6.52 while those who perceived their teachers' knowledge of subject matter as moderate and high had mean scores of 12.98 and 21.18 respectively meaning that the respondents(SS3 students) perceived their teacher to have high knowledge of the subject the subject matter.

On a similar vein, the findings of Ahmed [9] the result of the major finding of the study revealed that teachers' knowledge of the subject matter contribute to secondary school students' academic achievement in senior secondary schools in Adamawa state. The study was not also out of tune with that of Duru, Dominic, Udoha and Ochuba [10] in their study Effects of Teacher Subject Mastery on the Academic Performance of Secondary School Students in Jalingo Local Government Area of Taraba State which revealed that subject mastery by teachers significantly affects the academic performance of their students. In a related study conducted by Isa, Mammam, Badar and Bala [11] On the Impact of Teaching Methods on Academic Performance of Secondary School Students in Nigeria the findings revealed that most of the teachers' methods of teaching have a great effect on students' academic performance. The study also corroborates the findings of Atandi, Gisore and Ntabo [12] whose study revealed that teaching methods had both a positive and negative influence on students' performance on the students they teach. Another related noteworthy study is the work of Oketch, Mutisya,

Ngware, Sagwe and mosyoka [13] whose study primary concern was to understand some of the classroom-school factors that may explain the persistent differences in achievement between the top and bottom schools. The study focused on time-on-task (the length of exposure to any particular teaching and learning task) and curriculum content, and ask whether the two factors explains the difference in the achievement between the performance of top and bottom schools. Results shows that exposure to content is positively correlated with pupils' gain scores. Again, the study by Akinremi, Akinbode, Adeleke, Afolabi and Folorunsho [21] that examined the impact of SIWES on Academic Performance of Business Education students using the University of Lagos and Lagos State University as case studies indicated that SIWES program influenced students' academic performance and that SIWES enhances competency of students in their academic activities, prepares them for future job challenges and creates employment opportunities.

The second research question states, "Do Physical Facilities available in the colleges for the teaching of R&A program impact positively on students' performance". The outcome of the responses of the students revealed that students disagreed with all items therein. The implication of the findings is that the students believe that there are no adequate physical and instructional facilities standard workshops, safety equipment, practical teaching equipment, power supply, portable water supply, standard students' hostel for the teaching of R&A. Thus, the combined grand mean of their responses is 2.29. This is grossly below the general cut off mean.

This finding confirms previous findings of Mginba and Mwila [14] who observed in their study that Inadequate infrastructure negatively influences academic performance. It is also inline with the study of Oladipupo [15] who discovered in his study that inadequacy of physical resources like classrooms, laboratories, libraries and other academic resources are some of the problems bedevilling high institutions in Nigeria. The findings also corroborated the study of Yangambi [4] whose study revealed a dismal performance of students due to inadequate infrastructural facilities. On a related vein Onyebuanyi, Onovo, Ewe, & Njoku [5] in their study titled Impact of School Physical Facilities on Students' Academic Performance in Senior Secondary Schools in

Aba Education Zone of Abia recommend that adequate school physical facilities should be provided by appropriate authorities to ensure effective teaching and learning activities. The researchers opined that if facilities are made available and adequate, there would be effective performance among students in senior secondary schools.

The data presented in Table 3 provided answer to research question 3 on the assessment and evaluation in R&A. The Findings revealed that the respondents agreed to only five of the items viz. regular taking of students' attendance in classes, absent of examination malpractice in the colleges, non-menace of examination leakages regular students' class attendance and regular supervision of conducted CA and examinations. On the contrary, the respondents disagree to six of the items. The grand mean of the items (2.47) is lower than the general cut off mean.

This study is in harmony with that of Kamara& Dadhabai [16] who Revealed that assessment strategies from lecturers influenced students negatively. They further suggested that more emphasis be placed on assessment, seating accommodation and semester syllabus coverage by lecturers among other recommendations. In yet another related vein Luann [22] explained that Careless implementation of assessments may have negative consequences, especially when the needs of special education students are not considered. Thus, the improper implimentation of assessment and evaluation of students may nagetively affect their performance.

The study also corroborated an earlier research by Kamara & Dadhabai [16] in their study entitled Assessment factors influencing students' academic achievement where the findings revealed that assessment strategies used by lecturers influenced students negatively among other findings. This thus led to the researcher suggesting that more emphasis must be placed on assessment, seating accommodation and semester syllabus coverage by lecturers.

5. RECOMMENDATION

1. in-service teachers should be given training in developing and using continuous assessments through refresher courses

2. The various state board for technical education need to hire and train more quality assurance and standards officers to conduct monitoring and evaluation of curriculum implementation in the colleges to ensure programs most especially R&A are properly implemented to promote good academic performance of the learners.
3. Clarion calls should be made to philanthropist and alumni associations of the colleges to support the school with relevant learning facilities such as laboratory, workshop, furniture and equipment among others.
4. Government should as a matter of urgency upgrade physical facilities and teaching equipment to meet up with modern demands of technical colleges. Digital facilities should be provided in schools. While the schools managers on their part should also try to maintain such equipment.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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