Journal of Contemporary Science and Engineering Technology (JCSET) 1(2),
July-Sept 2022, ISSN: 2971-5695

Assessment of Workshop Safety Compliance among Mechanical Engineering Craft Practice Students in Technical Colleges in Rivers State

[1]Ordu, C. N., [1]Onyijne, D. O. & [2]Ochogba, C. O. (PhD)
[1]School of Secondary School (Technical),
Federal College of Education (Technical), Omoku
Rivers State University
[2]Community Secondary School, Ebogoro
Ogba/Egbema/Ndoni Local Government Area, Rivers State

Suggested Citation: Ordu, C. N., Onyijne, D. O. & Ochogba, C. O (2022). Assessment of workshop safety compliance among mechanical engineering craft practice students in Technical Colleges in Rivers State. *Journal of Contemporary Science and Engineering Technology* 1(2), 31-40

Abstract

The study examined the assessment of workshop safety compliance among mechanical engineering craft practice students in Technical Colleges in Rivers State. Specifically, this study sought to examine workshop safety compliance among mechanical engineering craft practice students in the use of hand tools in technical colleges in Rivers State. Three research questions were answered with three hypotheses tested at .05 level of significance. Descriptive survey design was adopted for the study. The population of the study was 32 teachers/instructors and 380 Mechanical engineering craft practice students in Rivers State. The population of teachers and instructors was manageable, then the researcher decided to adopt the entire population of teachers/instructors without sampling. On the other hand, 200 mechanical engineering craft practice students were simple randomly selected from the population. Self made survey questionnaire served as the instrument for data collection. The instrument was face validated by two experts in the Department of Vocational and Technology Education in Rivers State University, Nigeria. The reliability of the instrument was established using Cronbach Alpha reliability coefficient which yielded a coefficient of .84. Copies of the instruments were administered and retrieved by the researcher at the spot. Mean and Standard Deviation were used to answer the research questions while z-test statistical tool was used to test the hypotheses. The study found among others that students moderately; lubricate tools, check electrical connections of power tools before usage, sharpen blunt tools before usage, operate machine only with required skills, use machine guard, fold their long sleeve shirts when working on machine, lubricate machine parts, wear helmet in the workshop, keep fire extinguisher handy, use safety boot, position sand bucket, use goggles, use face mask and use ear-muff. Therefore, it was recommended among others that technical college management should set up disciplinary committee that will enforce disciplinary measures on students who violate workshop safety practices to streamline students' activities in the workshop in favour of workshop safety compliance.

Keywords: Mechanical Engineering Craft, Technical College & Workshop Safety Compliance

INTRODUCTION

Technical Colleges are post-secondary institutions which prepares students for academic and vocational job for entry into university and various occupations for self-reliance. Ochogba and Ordu (2019) described technical college as an institution that prepares individuals with technical skills relevant for employment and for admission into related courses in tertiary institutions. Similarly, Okwelle &

Normakoh (2019) defined technical college as an institution that provides secondary level education in technical and vocational education and training. Technical college programme is designed to accommodate several trades which includes Mechanical Craft Practice (MCP).

MCP is a general name used in describing trades that have direct bearing with metal works, welding/forming, servicing/repairs of machines, machine related equipment and appliances. The trade in this group include agricultural implement and equipment, machine works, auto body repair and spray painting, auto electrical work, auto body mechanic work, air-conditioning and refrigerator, welding and fabrication, engineering craft practice, foundry craft practice, and marine engineering craft. Furthermore, Mechanical craft practice is a trade that provides post primary technical education proficiency in fitting, turning and machining to all level of craftsman. The subject matter of mechanical engineering craft practice is specifically designed to provide skills and knowledge to fulfil the needs of the modern industry/workshops.

According to Baba in Amenger (2013) refers to workshop as a room or building where tools and machines are used for making or repairing things. Similarly, Amadike and Ochogba (2018) described workshop as a place or building where technology products are produced or repaired through technological manipulations. Workshop practice is a very vast one and it is very difficult for anyone to claim a mastery over it. Workshop practice should provide basic working knowledge of different tools, Equipment, Machinery, and techniques of mastery. In general, mechanical workshop is known by its trainings and the usage of workshop tools, machine tools, and equipment. Some workshops contain, machines, hazardous chemicals and other equipment which could be harmful to human life if not properly handled.

Moreover, workshops are set up to teach students who may not have prior knowledge of the operations of these machines, therefore, the tendency for accident to occur becomes possible. Health as a component of HSE is a state of been free from illness or injury, World Health Organization (WHO) in Business Dictionary (2017) defines health as state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Therefore, the need for safety in workshop is very important and supreme. Safety is freedom from danger and protection from risk of harm or injury. It is also protection against damage to machines tools and equipment, and prevention or removal of factors that will lead to near miss or accident in workshop.

Meanwhile, Moksen (2013) stated that the biggest challenge (which is one of the wrong practices) in school workshop is that students do not follow safety guidelines that have been made. In the same vein, Health and Safety Executive (2010) aver that some workshop users do not adhere to safety guidelines in the workshop. Apart from non-adherence to safety guidelines, some students work when they are exhausted or sick. The implication of this is that exhibiting wrong practices in the workshop could result in accident. This paper, therefore assess workshop safety compliance among mechanical engineering craft practice students in technical colleges in Rivers State

Statement of Problem

Mechanical engineering craft practice is a programme in technical college that is designed to equip students with practical skills in metal work. This practical activities are carried out in the workshop where tools and machines are been used. The tools and

machines are provided with sharp tip for easy cutting of metal work piece. Meanwhile, these tools could also be harmful to workshop users if not properly handled. However, there are reports of accidents in workshops due to the sharp edges of tools and machines that resulted in minor, major injuries and even death. Consequently, to ameliorate cases of accidents in the workshops, students are requested to maintain safety practices that will help in terms of mitigating, or better still stop accident in the workshop. Despite these measures, accidents still occur in technical colleges, thereby disrupting practical activities in technical colleges (Omeje, 2017). On this note, there is need for a check on student's workshop safety compliance so as to proffer solutions if the compliance level is low. It is against this backdrop that the researcher deemed it fit to assess workshop safety compliance among mechanical engineering craft practice students in Technical Colleges in Rivers State.

Purpose of the Study

The purpose of the study was to assess workshop safety compliance among mechanical engineering craft practice students in Technical Colleges in Rivers State. Specifically, the study sought to:

1. Ascertain workshop safety compliance among mechanical engineering craft practice students in the use of hand tools in technical colleges in Rivers State.
2. Investigate workshop safety compliance among mechanical engineering craft practice students in the use of machine in technical colleges in Rivers State.
3. Examine workshop safety compliance among mechanical engineering craft practice students in the use of personal protective equipment in technical colleges in Rivers State.

Research Questions

1. What is the workshop safety compliance among mechanical engineering craft practice students in the use of hand tools in technical colleges in Rivers State?
2. What is the workshop safety compliance among mechanical engineering craft practice students in the use of machines in technical colleges in Rivers State?
3. What is the workshop safety compliance among mechanical engineering craft practice students in the use of personal protective equipment in technical colleges in Rivers State?

Hypotheses

The following null hypotheses were tested at .05 level of significance:

1. There is no significant difference between the mean responses of teachers and students on the workshop safety compliance among mechanical engineering craft practice students in the use of hand tools in technical colleges in Rivers State.
2. There is no significant difference between the mean responses of teachers and students on the workshop safety compliance among mechanical engineering craft practice students in the use of machines in technical colleges in Rivers State.
3. There is no significant difference between the mean responses of teachers and students on the workshop safety compliance among mechanical engineering craft practice students in the use of personal protective equipment in technical colleges in Rivers State.

METHODOLOGY

The study adopted a descriptive survey design. The area of the study was Rivers State of Nigeria. The population of the study

was 32 teachers/instructors and 380 Mechanical engineering craft practice students in the four technical colleges in Rivers State, which include Government Technical College, Eleogu, Government Technical College Ahoada, Government Technical College Tombia and Government Technical College Port Harcourt. The population of teachers and instructors was manageable, then the researcher decided to adopt the entire population of teachers/instructors without sampling. On the other hand, 200 mechanical engineering craft practice students were simple randomly selected from the population. The sample size represented 52.63% of the entire population of mechanical engineering craft practice. Self made survey questionnaire titled "Workshop Safety Compliance of Mechanical Craft Practice Students" (WSCMCPS) served as the instrument for data collection. The instrument was partitioned into three sections that were structured in the pattern of Likert 5 point rating scale of Very Good (VG; 4-5), Good (G; 3-3.99), Moderately Good (MG; 2-2.99), Bad (B; 1-1.99) and Very Bad (VB; 0-.99). The instrument was face validated by two experts in the Department of Vocational and Technology Education in Rivers State University, Nigeria. The instrument was tested for reliability using Cronbach Alpha Reliability Coefficient tool. To achieve this, purposive sampling was used to select 8 teachers and 12 mechanical engineering craft practice students who were not part of the sample size. The reliability coefficient achieved was .84 which was used adequate for the study. Copies of the instruments were administered and retrieved by the researcher at the spot. Mean and Standard Deviation were used to answer the research questions and to ascertain the homogeneity of responses respectively. More so, z-test statistical tool was used to test the hypotheses. Mean scores < 3.00 were rejected while Mean scores ≥ 3.00 were accepted. Also, z-calculated values less than z-critical values were accepted while t-calculated values greater than t-critical values were rejected.

Results and Discussion of Findings

Research Question 1: What is the workshop safety compliance among mechanical engineering craft practice students in the use of hand tools in technical colleges in Rivers State?

Table 1: Mean Responses on Workshop Safety Compliance among Mechanical Engineering Craft Practice Students in the Use of Hand Tools

S/N	Workshop Safety Compliance in the use of Hand Tools	Teachers (n_1=32) $\bar{X}_1$	SD_1	Decision	Students (n_2=200) $\bar{X}_2$	SD	Decision
1	Keeping tools out of walkways	3.63	1.52	G	4.04	1.41	VG
2	Using the right tool	4.09	1.12	VG	4.21	1.14	VG
3	Returning tools to tool box after usage	4.31	1.26	VG	4.35	1.05	VG
4	Lubricating tools regularly	2.25	1.72	MG	2.33	1.67	MG
5	Checking tool handle before usage	4.16	.92	VG	4.34	.94	VG
6	Right positioning of tools in tool box	4.09	1.28	VG	4.35	1.01	VG
7	Not playing with tools	4.00	1.34	VG	4.13	1.28	VG
8	Checking the electrical connections of power tools before usage	2.34	1.79	MG	2.46	1.82	MG
9	Switching off power tools after usage	3.72	1.37	G	4.39	1.06	VG
10	Sharpening blunt tools before usage	2.34	1.79	MG	2.29	1.70	MG
	Total	**3.49**	**1.41**		**3.69**	**1.31**	

Source: Field Survey, 2022

Result in Table 1 shows that teachers and students are of the view that students moderately lubricate tools, check electrical connections of power tools before usage and sharpen blunt tools before usage, but comply very good in keeping tools away from walk way, using the right tools, returning tools to tools box after usage, checking tool handle before usage, positioning of tools in tool box, not playing with tools and switching off power tools after usage. This is in line with Moksen (2013) that stated that the biggest challenge (which is one of the wrong practices) in school workshop is that students do not follow safety guidelines that have been made.

Research Question 2: What is the workshop safety compliance among mechanical engineering craft practice students in the use of machine in technical colleges in Rivers State?

Table 2: Mean Responses on Workshop Safety Compliance among Mechanical Engineering Craft Practice Students in the Use of Machine

S/N	Workshop Safety Compliance in the use of Machine	Teachers (n_1=32)			Students (n_2=200)		
		$\bar{X}_1$	SD_1	Decision	$\bar{X}_2$	SD	Decision
1	Seeking approval before using machines	3.06	1.63	G	3.94	1.47	G
2	Looking out for warning signs on machines	3.47	1.57	G	3.95	1.23	G
3	Stopping the use of machines when tired or sick	3.88	1.66	G	3.94	1.44	G
4	Operating machine only with required skills	2.06	1.68	MG	2.78	1.75	MG
5	Using only good machines	3.53	1.50	G	3.86	1.40	G
6	Obeying machine rules and regulations	3.53	1.61	G	3.92	1.41	G
7	Proper use of machine guard	2.22	1.79	MG	2.94	1.83	MG
8	Folding of long sleeve shirts when working on machine	2.09	1.73	MG	2.96	1.87	MG
9	Lubricating machine parts regularly	2.03	1.69	MG	2.95	1.77	MG
10	Avoiding distraction when working with machines	4.09	1.17	VG	2.89	1.85	MG
	Total	**3.00**	**1.60**		**3.41**	**1.60**	

Source: Field Survey, 2022

Result in Table 2 shows that teachers and students are of the view that students moderately operate machine only with required skills, use machine guard, fold their long sleeve shirts when working on machine and lubricate machine parts, but comply very good in seeking approval before using machines, looking out for warning signs on machines, stopping the use of machines when tired or sick, using only good machines, positioning of tools in tool box, obeying machine rules and regulations and avoiding distraction when working with machines. This is in consonance with Health and Safety Executive (2010) that aver that some workshop users do not adhere to safety guidelines in the workshop. Apart from non-adherence to safety guidelines, some students work when they are exhausted or sick.

Research Question 3: What is the workshop safety compliance among mechanical engineering craft practice students in the use of personal protective equipment in technical colleges in Rivers State?

Table 3: Mean Responses on Workshop Safety Compliance among Mechanical Engineering Craft Practice Students in the Use of Personal Protective Equipment

		Teachers (n_1=32)			Students (n_2=200)		
S/N	**Workshop Safety Compliance in the use of PPE**	$\bar{X}_1$	**SD_1**	**Decision**	$\bar{X}_2$	**SD**	**Decision**
1	Constant use of over all	3.70	1.29	G	2.66	1.81	MG
2	Wearing helmet in the workshop	2.10	1.73	MG	2.56	1.75	MG
3	Keeping fire extinguisher handy	2.23	1.72	MG	2.55	1.76	MG
4	Using hand gloves	3.93	1.20	G	3.01	1.87	G
5	Use of safety boot	2.20	1.86	MG	2.57	1.76	MG
6	Positioning of sand bucket	2.23	1.79	MG	2.60	1.76	MG
7	Use of goggles	2.13	1.61	MG	3.08	1.82	G
8	Use of face mask	2.17	1.72	MG	2.60	1.76	MG
9	Use of earmuff	2.17	1.72	MG	2.60	1.78	MG
	Total	**2.54**	**1.63**		**2.69**	**1.79**	

Source: Field Survey, 2022

Result in Table 3 shows that teachers were of the view that students moderately wear helmet in the workshop, keep fire extinguisher handy, use of safety boot, position sand bucket, use goggles, use face mask and use earmuff, but comply very good in constant use of overall and hand gloves. On the other hand, students were of the view that students moderately keep fire extinguisher handy, use safety boot, position sand bucket, use face mask and use ear muff, but comply very good in using hand gloves and goggles. This is in conformity with Moksen (2013) that stated that the biggest challenge (which is one of the wrong practices) in school workshop is that students do not follow safety guidelines that have been made

Hypothesis 1

There is no significant difference between the mean responses of teachers and students on the workshop safety compliance among mechanical engineering craft practice students in the use of hand tools in technical colleges in Rivers State.

Table 4: z-Test Responses on Workshop Safety Compliance among Mechanical Engineering Craft Practice Students in the Use of Hand Tools

Categories	**N**	$\bar{X}$	**SD**	**DF**	**z-cal**	**z-crit**	**Decision**
Teachers	32	3.49	1.41				
				230	.75	1.96	Not Significant
Students	200	3.69	1.31				

Table 4 shows that teachers' Mean and Standard Deviation scores were 3.49 and 1.41 respectively, while students Mean and Standard Deviation scores were 3.69 and 1.31 respectively. The z-cal value was .75, while the z-crit was 1.96 at a .05 level of significance. This result shows that z-cal was less than z-crit, which means that the null hypothesis was accepted. Therefore, there was no significant difference between the mean responses of teachers and students on the workshop safety compliance among mechanical engineering craft practice students in the use of hand tools in technical colleges in Rivers State.

Hypothesis 2

There is no significant difference between the mean responses of teachers and students on the workshop safety compliance among mechanical engineering craft practice students in the use of machines in technical colleges in Rivers State.

Table 5: z-Test Responses on Workshop Safety Compliance among Mechanical Engineering Craft Practice Students in the Use of Machines

Categories	N	$\bar{x}$	SD	DF	z-cal	z-crit	Decision
Teachers	32	3.00	1.60				
				230	1.35	1.96	Not Significant
Students	200	3.41	1.60				

Table 5 shows that teachers' Mean and Standard Deviation scores were 3.00 and 1.60 respectively, while students Mean and Standard Deviation scores were 3.41 and 1.60 respectively. The z-cal value was 1.35, while the z-crit was 1.96 at a .05 level of significance. This result shows that z-cal was less than z-crit, which means that the null hypothesis was accepted. Therefore, there was no significant difference between the mean responses of teachers and students on the workshop safety compliance among mechanical engineering craft practice students in the use of machines in technical colleges in Rivers State.

Hypothesis 3

There is no significant difference between the mean responses of teachers and students on the workshop safety compliance among mechanical engineering craft practice students in the use of PPE in technical colleges in Rivers State.

Table 6: z-Test Responses on Workshop Safety Compliance among Mechanical Engineering Craft Practice Students in the Use of PPE

Categories	N	$\bar{x}$	SD	DF	z-cal	z-crit	Decision
Teachers	32	2.54	1.63				
				230	.48	1.96	Not Significant
Students	200	2.69	1.79				

Table 6 shows that teachers' Mean and Standard Deviation scores were 2.54 and 1.63 respectively, while students Mean and Standard Deviation scores were 2.69 and 1.79 respectively. The z-cal value was .48, while the z-crit was 1.96 at a .05 level of significance. This result shows that z-cal was less than z-crit, which means that the null

hypothesis was accepted. Therefore, there was no significant difference between the mean responses of teachers and students on the workshop safety compliance among mechanical engineering craft practice students in the use of PPE in technical colleges in Rivers State.

CONCLUSIONS

The study deduced that mechanical engineering craft practice students in technical colleges in Rivers State comply very good in workshop safety practices such as keeping tools away from walk way, using the right tools, returning tools to tools box after usage, checking tool handle before usage, positioning of tools in tool box, not playing with tools, switching off power tools after usage, seeking approval before using machines, looking out for warning signs on machines, stopping the use of machines when tired or sick, using only good machines, positioning of tools in tool box, obeying machine rules and regulations, avoiding distraction when working with machines, using hand gloves and goggles. On the other hand, the study deduced that students moderately lubricate tools, check electrical connections of power tools before usage, sharpen blunt tools before usage, operate machine only with required skills, use machine guard, fold their long sleeve shirts when working on machine, lubricate machine parts, wear helmet in the workshop, keep fire extinguisher handy, use safety boot, position sand bucket, use goggles, use face mask and use ear muff.

RECOMMENDATIONS

The following recommendations were made:

1. Mechanical engineering craft teachers should organize orientation programme for fresh students that will possibly last for a week in order to sensitize students on workshop safety that will help them in terms of complying with workshop safety practices.
2. Mechanical engineering craft instructors should as a matter of importance regularly supervise mechanical engineering craft students in the workshop to ensure that they comply with workshop safety practices.
3. Technical college management should set up disciplinary committee that will enforce disciplinary measures on students who violate workshop safety practices so as to streamline students' activities in the workshop in favour of workshop safety compliance.

References

Amadike, O., & Ochogba, C.O. (2018). Factors responsible for wrong practices in technical and vocational education and training workshops in Rivers State tertiary institutions. *Vocational and Technology Education Journal, 1*(1), 37-45.

Amenger, M. (2013). *Workshop management techniques needed to for improving the teaching electrical technology in Technical Colleges in Benue State*. Unpublished M.Ed. Dissertation University of Nigeria Nsukka.

Business Dictionary (2017). *What is health? definition and meaning.* https://www.businessdictionary.com /definition/health

Federal Republic of Nigeria (2013). *National Policy on Education (6th edition).* NERDC Press.

Health Safety Executive (2010). *Health and safety in engineering workshops.* https://www.hse.gov.uk/pUbns/priced/ hsg129.pdf

Moksen, A.B. (2013). Workshop safety management amongst students and teachers at vocational secondary schools. *Journal of Resources Development and Management, 1,* 41-43.

Ochogba, O.C., & Ordu, C.N. (2019). Techniques for enhancing students' participation in automobile mechanical workshop in Technical Colleges in Rivers State, Nigeria. *International Journal of Research and Innovation in Social Science, 7*(5), 2454-6186

Okwelle, P.C., & Normakoh, J. (2019). Assessment of health, safety and environmental procedures in technical colleges' workshops in Rivers State. *International journal of innovative science & engineering technology research, 7*(1), 1-6.

Okwelle, P.C., & Okeke, B.C. (2016). An overview of the role of technical vocational education and training for national development of Nigeria. *African Journal of Health Science Education, 12*(1) 162-182.

Omeje, H.O. (2017). Safety skills desired of workshop technicians/assessments for effective management of technical college workshop.