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SAFETY SKILLS REQUIRED FOR EFFECTIVE OPERATION OF FOUNDRY CRAFT WORKSHOP IN TECHNICAL COLLEGES

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Abstract: *The study was a survey research conducted to investigate the* safety *skills needed for effective operation of foundry craft workshop in technical colleges in Enugu State. Two research questions and two null hypotheses tested at .05 significant levels guided the study. A 61 items questionnaire was constructed and validated and its reliability of0.77was used to generate data for 25 respondents made up of 21 students and 4 teachers of foundry craft. The findings of the study showed that the61 items identified are needed for effective operation of foundry craft workshop in technical colleges. The study concluded among other things that safety should be everybody's business and there should a solid student-teacher cordial relationship in the foundry craft workshop.*

Keywords*: Safety, skills, operation, foundry*

INTRODUCTION

Safety is the condition of being protected from danger, risk or injury (Mames, 2016) It is a relative freedom from danger, risk or threat of harm. It is the state of being "safe", the condition of being protected from harm or other non-desirable outcomes. It is referring to the control of recognized hazards in order to achieve an acceptable level of risk (Oakes, 2014).Safety is the condition of not being in danger. The state of being protected from danger (Kristen, 2017).Safety means safeguarding against damage to machine tools and materials as well as preventing personal injuries (Prashar & Bansal, 2008). It means safeguarding against damage to machine tools and materials as well as preventing personal injuries.

Safety skills are those skills that seek to either to minimize or eliminate hazardous conditions that can cause bodily injury (Weavers, 2012).It is the effort directed at preventing or eliminating accidents in the foundry workshop by the teachers and students.

Skill is the ability to perform activity expertly (Osinem & Nwoji, 2010).It is a well established habits of doing things and it involves acquisition of performance capabilities through repetition of an operation. Skill is the demonstration of dexterity.

Foundry is a factory that produces metal castings. It is a commercial establishment for producing cast metals by pouring molten metal into a mold and allowing it to solidify. Metals are cast into shapes by melting them into a liquid, pouring the metal into a mold and removing the mold material after the metal has solidified as it cools (Campbell, 2013). Foundry craft works involves many processes especially in the making of patterns; cores and moulds for producing intricate shapes (Jain, 2012).In foundry workshop in technical colleges teachers and students are prone to accidents as a result of the nature of the operations involved in foundry craft workshop. Foundry craft teachers and students must possess safety skills in order to prevent occurrence of accidents which can result in human and material resource wastage. If safety skills are acquired by teachers and students there are possibilities of reducing accidents in foundry workshop

The concern of this study is that there seems to be lack of safety awareness in most of our school workshop especially the foundry craft workshop of our technical colleges. The problem of this study therefore is “what are the safety skills required for effective operation of foundry craft workshop in our technical colleges?”.

The purpose of this study is to determine the extent of safety skills required for effective operation of foundry craft workshop in technical colleges. Specifically, the study seeks to determined:

1. The extent of safety skills required by foundry craft students of technical colleges in operating hand tools in foundry craft workshop.
2. The extent of safety skills required by foundry craft students of technical colleges in operating machine tools in foundry craft workshop.

RESEARCH QUESTIONS

The following research questions were posed to guide the study.

1. What are the safety skills required by foundry craft students of technical colleges in operating hand tools in foundry craft workshop?

2. What are the safety skills required by foundry craft students of technical colleges in operating machine tools in foundry craft workshop?

NULL HYPOTHESES

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference between the mean responses of students of technical colleges and their teachers on the skills required for effective operation of hand tools in foundry craft workshop in Technical Colleges in Enugu State.
2. A significant difference does not exist between the mean responses of students of technical college and their teachers on the safety skills required in operating machine tools in foundry craft workshop in Technical Colleges in Enugu State.

METHOD

The design adopted in this study was survey. The area of the study was technical colleges in Enugu State. Enugu State is made up of 17 local government areas and 26 technical colleges (STVSMB,2015).The population for the study was 25 respondents (comprised of four teachers and 21 students) of foundry craft at Government Technical College (G.T.C), Enugu (the only technical college that offer foundry craft in Enugu State). The population for the study was manageable. There was no sampling. The instrument for data collection was a structured questionnaire developed by the researcher using a four point responses scale of strongly agree (4),agree (3), disagree (2) and strongly disagree (1).The instrument was validated by three experts and its reliability (r=77) coefficient was established using Cronbach alpha measure of internal consistency.

The instrument was administered by hand with the aid of a research assistant. The return rate was 96%.Mean and standard deviation was used to answer the research questions while t-test statistic was used to test the null hypotheses at 0.05 level of significance.

RESULT

Data for the study were presented and analyzed based on the research questions and hypotheses that guided the study. The details are contained in the tables 1-4.

RESEARCH QUESTION 1

What are the safety skills required by foundry craft students of technical colleges in operating hand tools in foundry craft workshop?

Table 1: Mean and standard deviation of responses on the safety skills required for effective operation of hand tools in foundry craft workshop in technical colleges in Enugu State

S/N	Item statement	Teachers X1	SD1	Students X2	SD2	Overall X3	SD3	Decision
1	Use of right tool for right job	3.50	1.00	3.38	0.84	3.44	0.92	Agree
2	Keep tools in good working condition	3.50	0.57	3.60	0.49	3.55	0.53	Agree
3	Return tools to their position after use	3.50	0.57	3.38	0.76	3.44	0.67	Agree
4	Keep all cutting tools sharp	3.25	0.76	2.90	0.48	3,10	0.62	Agree
5	Do not use files without handle	3.50	0.57	2.80	0.49	3,15	0.53	Agree
6	Do not use screw drivers as chisel	3.50	0.57	2.90	0.97	3,20	0.77	Agree
7	Do not use screw drivers as bars	3.50	0.57	2.90	0.97	3,20	0.77	Agree
8	Hammers should not have broken handles	3.25	0.50	3.20	0.75	3,22	0.63	Agree
9	Check for loose handle	3.50	0.57	3.70	0.75	3,60	0.66	Agree
10	Use proper size of hammers & weight for the job	3.50	0.57	3.60	0.57	3,55	0.57	Agree
11	Pointed tools should never be carried in clothing pockets	3.50	0.57	2.65	0.97	3,10	0.77	Agree
12	Keep tools clean after use	3.50	0.57	3.85	0.36	3.67	0.47	Agree
13	Firmly secured workbench to its base	3.50	0.57	3,80	0.73	3,65	0.65	Agree
14	Check the vice for cracks before using it	3.25	1.60	3.60	0.73	3.43	1.16	Agree
15	Use a vice large enough to hold the work without stain	3.75	0.50	3.57	0.36	3.66	0.43	Agree
16	Never: weld the base of a vice to any metal	3.50	0.57	3.38	0.50	3.44	0.53	Agree
17	attempt to repair a broken vice jaw by welding or brazing	3.50	0.57	3.60	0.50	3.55	0.53	Agree
18	cut the jaws of a vice	3.50	0.50	3,70	0.56	3.60	0.53	Agree
19	apply a heavy load at the corner of the jaw of a vice	3.50	0.57	3.00	0.97	3.25	0.77	Agree
20	hammer on the handle of a vice for extra tightening	3.50	0.57	3.38	0.70	3.44	0.64	Agree
21	use the jaws as an anvil	3.50	0.50	3.60	0.70	3.55	0.60	Agree
22	unscrew the jaws more than they were design for	3.50	0.57	3.10	0.70	3.20	0.64	Agree
23	A file should not be used in sawing motion	3.50	0.57	3.80	0.36	3.65	0.47	Agree
24	The cutting teeth on a file should forward facing	3.50	0.50	3.80	0.36	3.65	0.43	Agree
	Use a:							
25	flat file for general purpose	3.75	0.50	2.71	0.97	3.23	0.74	Agree
26	square file for enlarging rectangular holes	3.50	0.50	3,70	0.56	3.60	0.53	Agree
27	round file for enlarging round holes	3.50	0.57	3.00	0.97	3.25	0.77	Agree
28	half round file to smooth curved faces of grooves	3.50	0.57	3.38	0.70	3.44	0.64	Agree
29	triangular file on acute angles	3.50	0.50	3.60	0.70	3.55	0.60	Agree
30	double cut file to file brass, bronze copper and tin	3.50	0.57	3.10	0.70	3.20	0.64	Agree
31	Soak your files in distilled white vinegar overnight to remove rust	3.50	0.57	3.80	0.36	3.65	0.47	Agree
32	Clean your file often	3.50	0.50	3.80	0.36	3.65	0.43	Agree
33	Never put water on metal fire	3.75	0.50	2.71	0.97	3.23	0.74	Agree
34	Have dry pile of sand and shovel ready to put out fire	3.50	0.50	3,70	0.56	3.60	0.53	Agree
35	Always use clean metal as feedstock	3.50	0.57	3.00	0.97	3.25	0.77	Agree
36	Always use safety glasses	3.50	0.57	3.38	0.70	3.44	0.64	Agree
37	Always operate in a well ventilated area	3.50	0.50	3.60	0.70	3.55	0.60	Agree
38	Never use crucible that has been damaged	3.50	0.57	3.10	0.70	3.20	0.64	Agree
39	Operate in clear work areas spilled molten metal can travel for a great distance	3.50	0.57	3.80	0.36	3.65	0.47	Agree
	Grand Mean	**3.50**	**0.59**	**3.27**	**0.66**	**3.43**	**0.63**	**Agree**
		3						

Data in table 1 showed that all the respondents agreed that all the items indentified are safety skills required for effective operation of hand tools in foundry craft workshop in technical colleges in Enugu State. The mean values were above the benchmark of 2.50 and the grand mean for the two groups of the respondents were also above 2.50.

HYPOTHESES 1

There is no significant difference between the mean responses of students of technical colleges and their teachers on the skills required for effective operation of hand tools in foundry craft workshop in Technical Colleges in Enugu State.

Table 2: t-test analysis of the mean responses of students of technical colleges and their teachers on the safety skills required for effective operation of hand tools in foundry craft workshop in Technical Colleges in Enugu State

Respondents	N	X	SD	Df	t-cal	t-crit	Decision
Teachers	4	3.50	0.59	23	±0.21	±1.96	Do not
Students	21	3.45	0.63				Reject
						Ho_1	

The data presented in Table 2 indicated that at 0.05 level of significant, t-calculated of 0.21 is less than t-critical which is 1.96.This implies that there is no significant difference in the mean ratings of students of technical colleges and their teachers on the safety skills required for effective operation of hand tools in foundry craft workshop in Technical Colleges.

Table 3: Mean and standard deviation of responses on the safety skills required for effective operation of machine tools in foundry craft workshop in technical colleges in Enugu State

S/N	Item statement	Teachers		Students		Overall		Decision
		X_1	SD_1	X_2	SD_2	X_3	SD_3	
	During machine operation use							
40	Tightly fitted safety goggles (face shield)	3.75	0.50	2.71	0.97	3.23	0.74	Agree
41	Ear protection	3.50	0.50	3,70	0.56	3.60	0.53	Agree
42	Safety shoes	3.50	0.57	3.00	0.97	3.25	0.77	Agree
43	Appropriate respiratory equipment	3.50	0.57	3.38	0.70	3.44	0.64	Agree
44	Guards	3.50	0.50	3.60	0.70	3.55	0.60	Agree
45	Keep gards properly adjusted	3.50	0.57	3.10	0.70	3.20	0.64	Agree
	Do not wear:							
46	Rings	3.50	0.57	3.80	0.36	3.65	0.47	Agree
47	Chains	3.75	0.50	2.71	0.97	3.23	0.74	Agree
48	Tie	3.50	0.50	3,70	0.56	3.60	0.53	Agree
49	Over sized safety cloths	3.50	0.57	3.00	0.97	3.25	0.77	Agree

50	Read instructional manual before operating machines	3.50	0.57	3.38	0.70	3.44	0.64	Agree
51	Inspect machine tool before switching it on	3.50	0.50	3.60	0.70	3.55	0.60	Agree
52	Clean the chips around the machine area	3.50	0.57	3.10	0.70	3.20	0.64	Agree
53	Support the work pieces as secure as possible when drilling	3.50	0.57	3.80	0.36	3.65	0.47	Agree
54	Use grinding machine to remove the gate and risers	3.75	0.50	2.71	0.97	3.23	0.74	Agree
55	Use pyrometer to determine the casting temperature required	3.50	0.50	3,70	0.56	3.60	0.53	Agree
56	Use automatic ladle to pour the molten metal into the mold for casting	3.50	0.57	3.00	0.97	3.25	0.77	Agree
57	Use a nosh rated dusk mask	3.50	0.57	3.38	0.70	3.44	0.64	Agree
58	Wear proper gloves	3.50	0.50	3.60	0.70	3.55	0.60	Agree
59	Wear cotton baseball hat	3.50	0.57	3.10	0.70	3.20	0.64	Agree
60	Do not toy with machine tools during pouring	3.50	0.57	3.80	0.36	3.65	0.47	Agree
61	Do not look into the furnace with naked eyes	3.75	0.50	2.71	0.97	3.23	0.74	Agree
	Grand Mean	**3.54**	**0.54**	**3.00**	**0.76**	**3.40**	**0.66**	**Agree**

The data in table 3 showed that all the respondents agreed that all the items indentified are safety skills required for effective operation of machine tools in foundry craft workshop in technical colleges in Enugu State. The mean values were above the benchmark of 2.50 and the grand mean for the two groups of the respondents were also above 2.50

HYPOTHESES 2

A significant difference does not exist between the mean responses of students of technical colleges and their teachers on the skills required for effective operation of machine tools in foundry craft workshop in Technical Colleges in Enugu State.

Table 4: t-test analysis of the mean responses of students of technical colleges and their teachers on the safety skills required for effective operation of machine tools in foundry craft workshop in technical colleges in Enugu State

Respondents	N	X	SD	Df	t-cal	t-crit	Decision
Teachers	4	3.54	0.54	23	±1.70	±1.96	Do not
Students	21	3.00	0.66				Reject Ho_2

DISCUSSION OF FINDINGS

The analysis of respondents to the two research questions showed that all the 61 items listed had mean ratings that qualify them as safety skills required for effective operation of

foundry craft workshop in Technical Colleges. This was observed from overall mean(x) values which range between 3.10 and 3.67 for research question one and between 3.20 and 3.65 for research question two. This indicates that the respondents agreed because the mean values were above the benchmark of 2.50.

The grand mean (x) for the two groups of the respondents respectively in the two research questions were above 2.50, showing that they agreed to the items as safety skills required for effective operation of foundry craft workshop in Technical Colleges. The closeness of the responses as shown by the entire standard deviation (SD) indicates homogeneity in their responses. Testing of the two hypotheses as shown in table 2 and 4 revealed that there is no significance difference on the mean responses of students of technical colleges and their teachers on the safety skills required for effective operation of foundry craft workshop in our technical colleges in Enugu State.

CONCLUSION

Safety should be everybody's business. For teachers and students of foundry craft to be productive in the workshop, they should be safety conscious. Safety skills are highly required for effective operation and productivity of any foundry craft workshop. For a better operation of foundry craft workshop, the teachers and students should be dedicated. There should a solid student-teacher cordial relationship. They should be ready to obey safety rules. They should not mount on any machine in the workshop without proper training and orientation. They should be guided by the machine tool operating rules. Operational safety skills required the spirit of team work and maximum cooperation in the workshop. The teachers should develop in them transformation power which will inspire the students to learn new ideas in safety skills.

RECOMMENDATIONS

Based on the findings of the study the following recommendations were made:

1. Only sound and trained technical teachers should be allowed to manage foundry craft workshop in our technical colleges.
2. The government and technical education managers should provide modern foundry workshop and equipment in all the technical colleges in the state..
3. Teachers and students of foundry should be motivated by the government through the provision of foundry craft material incentives.

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