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Technical Education Skill Improvement Needs and Ethics Required by Technical Teachers for Machine Shop Operation in Enugu State

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Abstract
Technical education aimed at acquisition of practical and applied skills in various occupations. Though, instructors in technical colleges lack the required skills and ethics needed in machine shop operation As a result of this deficiency, there is need for skill improvement and inculcation of ethics to students. The study is a descriptive research. Four research purposes, four research questions and a null hypothesis were formulated to guide the study. The instrument for the study was a structure questionnaire. The instrument contained fifty-four (54) test items. Three research experts from Industrial Technical Education and Educational Foundations, University of Nigeria, Nsukka validated the instrument. The reliability coefficient of the study was established using Cronbach Alpha and the reliability of the entire instrument was 0.84 which indicated high internal consistency. Based on the analysis, the study revealed that technical teachers (instructor) requires skill improvement needs in lathe, milling and shaper machines. It also revealed that instructors are required to identify and practice ethics in instructional delivery of machine shop operation. The investigation indicated that technical teachers require to be taught the updates in skills required in operating modern machine as well as transcending such skills to students. The researcher therefore recommends that teachers should be retrained on modern skills through workshop and seminars as well as impact to students the ethics of the profession.

Keyword: Machine Shop Operations, Technical Teachers, Technical Education, Skill Improvement

Introduction

Technical education has been recognized worldwide as the best solution to technological, industrial and economic development of a developing country in relation to provision and utilization of equipment, skills and ethics required of occupations. Buttressing further, the National Policy on Education (2007) stated that technical education is that aspect of education that leads to the acquisition of practical, and applied skills as well an basic scientific knowledge. Unfortunately, instructors in technical colleges are incompetent to impart to students the needed skills, knowledge and ethics required in machine shop operation. The incompetency among instructors is that they lack skills in instrument development and made use of obsolete machine and equipment in teaching and learning situation (Oranu, 2006). To change the preventing use of obsolete machine, instructor are expected to give full vocational training (skills) completely intended to prepare students for entry into various occupation which enables them to be employed as operatives, craftsman and artisans in industries and the like. But the skills expected of technical college students are not fully yet developed.

Skill development can be referred to as the productive capacities acquired through training on which enables individuals in all areas of economy to become fully and productively engaged in livelihood as well as have opportunities to adopt those capacities to access changing demand of economy and labour market. It focuses on the learning and acquisition of skills.

Skill development according to King and Palmer (2007) is described as the productive capacities acquired through all levels of education as training in an informal, non-formal and on the job setting which enables individuals to become fully and productively engaged in livelihood and meet changing demand of the labour market. The accomplishment of this can be guaranteed where trainees are trained with modern machines and equipment which are currently used in industries. In line with the above description Palmer (2006) emphasized that skill development at all levels dependent on the quality of educational training and the state of enabling environment surrounding the skill development.

However, when environmental factors like machine, equipment and methods are improved particularly in machine shop operation skills will be improved. Buttressing skill improvement Okorie (2006) noted that skill improves when procedural instruction is matched with performance activities. He further explained that the improvement of skills and abilities in technical education in dependent of the teacher having the real situation on the work. Skill can be improved when teachers are updated with current methods adopted in the use of these machines in teaching-learning situation. Technical teachers that are updated up to five years with skill are regarded as experienced technical teachers and the teachers with less than five years cognitive experience as less experienced. But in situation where both experienced and less experienced teachers are trained with obsolete machines and methods they require retraining. According to Miller (2006) retraining of technical teachers of technology is important to ensure improvement of the skills so that they can play their role in achieving vision 2020 which include eradication of poverty, unemployment and repositioning Nigeria as one of the 20 economics of the world. In the same vein, Awelu (2015) stressed that skill improvement need is important as it provides self reliance to both the teacher and students, reduces poverty as well as unemployment such that economic growth of the country increases.

Skill improvement are needed but cannot be fully accomplished without incorporating the ethic of technical teachers profession required. Ethnics according to Ogbonna and Egoigwe (2019) are a moral principle that governs person behaviour in conducting activity. While Oswalt (2010) stressed that ethnical conducts and value system are branch of philosophy which can be applied to divers problem in form of supernaturalism, institutionalism, consequentualism, non-consiquentualism , virtual ethics and situation ethics. In this context of skill improvement needs we should discuss ethical theory in form of consequentialism and virtual ethics. Consequentualism takes cognizance of moral-cost benefit analysis of actions and their effect on the environment. Boerce (2006) emphasized and maintained that consequentialism deals with whatever produces the greatest amount of good consequence which favours actions that produces the greatest amount of happiness. Following this theory, skills can be improved in machine shop operations through provision and utilization of modern machines and equipments, modernization of the methods applied in handling them by teachers and students in the production of goods and services. If these processes are injected into teaching and learning students will be happy and have the expectation of being employed after graduation, while virtual ethics emphasis the desire for the best for people in a unique situation.

To foster skill improvement needs and ethics teacher should learn about ethics (virtual and consequentialism) by inculcating institutional and behavioural practices that foster ethical school culture which promotes core values of respect, responsibility, integrity honour and care for self as well as others (Sarup & Kathleen, 2014). Also, ethical models like ethics of profession plays a vital role in the inculcation of skill improvement needs of teachers of mechanical engineering craft practice. Ethics of profession are those ethical conducts that include the principles, codes and standards guiding teaching profession. If these theories and

models are fully utilized in the teaching of machine shop operations student skill will be improved.

Machine shop operation is an aspect and occupation in mechanical engineering craft practice. It involves any process whereby a material is cut into stipulated shape and size by controlled material removal process: The controlled materials removal can also be known as subtractive manufacturing. Machine shop operation connotes activities in machine technology, cutting conditions and relationship of subtractive techniques. It involves the maintaining of hand tools operation in lathe machine, milling machine, shaper machines and other machine tools. For effective skill improvement needs and ethics, teachers should inculcate the utilization of machine and hand tools in the above listed machines.

Lathe machine is a machine tool that rotates a workpiece about an axis of rotation to perform various operations such as cutting, sanding, knurling etc. Lather can further be described as a machine tool that holds work between centres's or in a chuck while rotating against a fixed tool to form a cylindrical section. Chapman (2005) added that lathe gives or shows a constant in the axis of revolution of the work and direction of tools travel. The Lathe performs more function than the drill press in machine shop operation. However, drilling machine performs less and distinct work than the milling machine.

Milling machine is a power driver machine that cut by means of multi-tooth rotation cutter. The mills are classified on the basis of the position of the spindle which is horizontal or vertical. The cutters and holding devices allow a range of cutting possibilities. The milling machine work smothers than the shaper machine.

produce faster cut, but rougher than the milling machine, smaller than the planning machine and perform work like the grinding machine. It removes materials from the work piece by abrasive Shaper machine are used for shaping horizontal, angular, vertical or even cured surfaces. The heat is controlled by the use of coolant. These machines are provided in the machine shop to easy the labour of technical teachers in performing the required operations. Unfortunately, skills needed to perform these operations are lacking among technical teachers talk less of transcending such competence to students. Therefore, it becomes important for technical education to introduce skill improvement needs and ethics in machine shop operation either by retraining of their subjects.

Statement of the Problem

Graduates performances in various sectors of their employment signified that they are incompetent. Therefore, graduates incompetency in performance activities greatly needs the inclusion of skill improvement and ethics in all areas of technical profession including machine shop operation. Emphasizing this, Oranu (2006) stated that technical education teachers lack skills in teaching the courses and made use of obsolete machine and equipment in impacting knowledge to their students. In the same vein, Palmer (2007) reiterated the improvement of skill development is dependent on the quality of educational training and the state of enabling environment surrounding the skill development and improvement. Incompetency of teachers was as a result of quality of educational training and enabling environment they were exposed to.

In as much as graduate performance on the job should be improved, ethical conducts and value system must be applied to diverse problems which machine shop operation teachers are facing. In order to alleviate the problem, it is important to investigate how technical education skill improvement needs and ethics should be inculcated in machine shop operations by instructors in Enugu State.

Purpose of the Study

The General purpose of the study was to investigate technical teachers' skill improvement needs and ethics required in machine shop operations in Enugu State. Specifically the study sought to determine;

1. Skill improvement needs of technical teachers in lathe machine operations.
2. Skill improvement needs of technical teachers in milling machine operations
3. Skill improvement needs of technical teachers in shaper machine operations
4. Ethical conducts required by technical teacher to improve skills.

Research Questions

The following research questions were formulated based on the specific purposes?

1. What are the skill improvement needs of technical teachers in lathe machine operations?
2. What are the skill improvement needs of technical teachers in milling machine operations?
3. What are the skill improvement needs of technical teachers in shaper machine operations?
4. What are the ethical conducts required by technical teachers to improve skills?

Null hypothesis

The null hypothesis was formulated to guide the study and was tested at 0.05 level of significance

Ho_1: There is no significant difference between the mean response of experience and less experience technical teachers on the ethical conducts required by technical teachers to improve skills in mechanical shop operations.

Methodology

The descriptive research design was adopted. Survey research design involves the study of both small and large population through sampling and use of questionnaire for data collection (Osuala, 2005). The research was carried out in Enugu State. The population for the study consist of 30 technical teachers involved in teaching mechanical engineering craft practice of which machine shop operation is involved. The questionnaire was used as instrument for data collection. It contained a total of 54 items based on the purpose, research questions and hypothesis posed for the study. The instrument was validated by two experts in Industrial Technical Education and one in Department of Educational Foundations, University of Nigeria, Nsukka. The instrument was administered and retrieved from the respondents by the researcher and two research assistants. A return rate of 100% was recorded as 54 copies were distributed and 54 copies were returned from the technical teachers/instructors. The reliability of the instrument was established using Cronbach Alpha. The Coefficient of entire reliability test for the instrument was 0.84 which indicated that the instrument was highly reliable. The data collected was analyzed using mean and standard deviation for research questions. The t-test was used to analyze the null hypothesis formulated for the study. Any item with a mean score of 3.50 and above was considered as needed because it was the upper limit of the rating of items and below was rejected or recorded as not needed.

Analysis:

Table 1: Technical Teachers Mean Response on Skill Improvement Needs in Lathe Machine Operations.

S/No.	Skill improvement Need in Lathe Machine Operation	Mean ($\overline{X}$)	SD	Remarks
1	Lathe machine methods of holding workpiece	4.00	0.68	Needed

2	Sharpening/cutting tools	3.90	0.77	Needed
3	Choosing cutting tool	4.32	0.78	Needed
4	Choosing cutting speed	3.68	0.78	Needed
5	Boring	4.45	0.83	Needed
6	Counter boring	4.46	0.81	Needed
7	Spinning	3.77	0.74	Needed
8	Roll Flowing	4.46	0.69	Needed
9	Spring winding	3.68	0.82	Needed
10	Knurling	3.76	0.74	Needed
11	Threading	4.45	0.77	Needed
12	Drilling and reaming	3.51	0.81	Needed
13	Straight turning and filling	4.38	0.73	Needed
14	Use of steady rest and flower rest	4.37	0.72	Needed
15	Polishing and filling	4.22	0.73	Needed

Table 1, Showed that the mean item numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15 exceeded the criterion level of 3.50 and their values lies between 3.51 to 4.46 and were considered needed. Those values indicated that it is needed to introduce skill improvement in lathe machining operations in Technical Colleges in Enugu State.

Table 2: Technical Teachers Mean Responses on Skill Improvement Needs in Milling Machine Operations**.**

S/No.	Skill improvement Need in Milling Machine Operation	Mean ($\bar{X}$)	SD	Remarks
16	Milling cutters and holders	4.07	0.74	Needed
17	Plain milling of flat surface	4.39	0.76	Needed
18	Facing operation of motor bases and squaring the end of shaft	3.90	0.76	Needed
19	Indexing operations including clear teeth, slot fluting and holes	4.61	0.75	Needed
20	Plate and barrel cams	4.16	0.68	Needed
21	Cavities for plastic glass or die-casting moulds	4.06	0.92	Needed
22	Forging and punching press die	4.46	0.73	Needed
23	Templates	4.29	0.83	Needed
24	Milling chambers or barrel stock	4.39	0.63	Needed
25	Milling a key or groove	4.16	0.74	Needed
26	Jet and steam turbine buckets, roots and bucket surfaces	3.93	0.74	Needed
27	Slots in lathe faces	4.00	0.79	Needed
28	Spiral flute in twist drill	4.00	0.75	Needed
29	T-slot in machine table	4.46	0.77	Needed
30	Teeth in racks	3.68	0.65	Needed
31	Bevel and spur gear teeth	4.38	0.79	Needed
32	Tangs on twist drill shamks	3.77	0.79	Needed
33	Contour of inflate variety with straight or spiral element	4.46	0.75	Needed

34	Convex and concave surfaces	3.52	0.76	Needed
35	Determining cutting feed and speed	3.67	0.76	Needed
36	Squaring stock on a milling machine	3.68	0.79	Needed
37	Sphines on shafts	3.90	0.80	Needed
38	Maintaining milling machine	4.45	0.63	Needed

Data presented in Table 2 revealed that the mean of item numbers 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37 and 38 exceeded the criterion level of 3.50. The mean of these items are within 3.52 to 4.61. These showed that these items in milling machine operation need skill improvement in technical colleges in Enugu State.

Table 3: Technical Teachers Mean Response on Skill Improvement Needed in Shaper Machine Operations

S/No.	Skill improvement Need in Shaper Machine Operations	Mean ($\overline{X}$)	SD	Remarks
39	Planning irregular surfaces on the shaper	4.13	0.70	Needed
40	Adjusting the shaper forward stroke	4.22	0.71	Needed
41	Making vertical and angular cuts on a shaper	3.75	0.76	Needed
42	Making horizontal cut with a shaper	4.32	0.79	Needed
43	Cutting keyways on the shaper	3.77	0.78	Needed
44	Groove shaping	3.84	0.60	Needed
45	Determining cutting speed and feed	4.45	0.53	Needed
46	Maintaining shaper machine	3.67	0.87	Needed

Data presented in Table 3 revealed that the mean of items numbers 38, 39, 40, 41, 42, 43, 44 and 45 exceeded the criterion level of 3.50. The means of these items lies within 3.67 to 4.45. These showed that the items in shaper machine operations need skill improvement in technical Colleges in Enugu State.

Table 4: Technical Teachers Mean Response Ethical Conducts Required to Improve Skill

S/No.	Ethical Conducts Required	Mean ($\overline{X}$)	SD	Remarks
47	Technical teachers avoid unethical conducts in educational practice and performance	3.93	0.91	Needed
48	Teachers adopt rationale moval cost benefit analysis during delivery of instructions	3.80	1.00	Needed
49	Technical teachers adopt strategies that produces the greatest amount of good consequence	3.80	0.81	Needed
50	Teachers accommodate students of varied cultural background, learning speed and social interaction background during instruction	3.77	0.92	Needed

51	Technical teachers should demonstrate professional principles, code and standards, during instruction.	4.27	0.74	Needed
52	Teachers demonstrate good relationship to students and show admirable personality	4.17	0.87	Needed
53	Teacher show and inculcate in students institutional and behavioral practices that fasters ethical school culture.	3.97	0.51	Needed
54	Teachers demonstrate core value of respect, responsibility integrity, honour and care of self and others.	3.70	0.88	Needed

Data presented in Table 4 revealed that the mean of items number 47, 48, 49, 50, 51, 52, 53 and 54 exceeded the criterion level of 3.50. The mean of these items lies within 3.70 to 4.27. These indicated that the items are the ethnical conducts required by technical teachers to improve skills of machine shop operators.

Table 5: Result of t-test Computation for Mean Response of Experience and Less- Experience Technical Teachers on the Ethical Conducts Required by Technical Teachers to Improve Skills in Machine Shop Operation

Respondents	Mean	SD	N	df	t-cal	t-ratio	Decision
Experience	3.95	0.73	16	28	0.81	0.26	Significant
Less-experience	3.74		14				

From the data analysis, in Table 5, the t- test calculated was 0.81 and the t-ratio was 0.26. The calculated t-test value was greater than the critical value of t. The null hypothesis (Ho) was rejected and the alternative hypothesis (H_A) upheld. The study revealed that there was a significant difference between the mean response of experience technical teachers and less experience technical teachers on the ethical conducts required by technical teachers to improve skills in handling machine shop operations. Also, the experience technical teachers indicated the factors generated on ethical conducts are required by technical teachers to improve skills in machine shop operations.

Discussion of the Findings

The findings of study revealed the extent to which technical teachers need skill improvement and ethics in machine shop operations in Technical Colleges in Enugu State. The skills identified by the teachers in lathe machine operation that needs skill improvement include lathe machine method of holding workpiece, sharpening cutting tools, choosing cutting tools, choosing cutting speed, boring, counter bring, spinning, roll flowing, spring winding, knurling, threading, drilling, straight turning and filling, use of steady rest and flower rest, as well as filling and polishing. These findings are similar to Bakare (2010) who opted that problem solving skill is a requisite skill needed by welding and fabrication craftsmen in industries which calls for students improvement in skill for positive achievement in welding and fabrication

industry. Similarly, these skills need improvement by both technical teachers as well as students in machine shop operations.

Furthermore, the findings of the study revealed that twenty-two (22) skills in milling machine needed skill improvement. They are skills in milling cutters and holders, plain milling of flat surfaces, facing operations of motor based and squaring the end of shafts, indexing operations eg holes, plat and barrel cams, cavity of plastic glasses or die casing moulds, forging and punching press dies, templates, milling chambers or barrel stock, milling a key or grove, jet and steam turburine buckets, roots, slot in Lathe faces, spiral flute in twist drill, T-slot in machine table, teeth in rackets, bevel and span gear, tang on twist drill shank, contour of infinite varieties with straight or spiral elements, convex and concave surfaces, determining cutting speed and feed, squaring stock on a milling machine, spines on shafts and maintaining milling machine. The identified areas needs skill improvement in milling machine operations.

The study also revealed that technical teachers require skill improvement need in shaper machine operations. The respondents identified these skills among others, planning irregular surfaces on the shaper machine, adjusting the shaper forward stroke, making veridical and angular cut on a shaper, making horizontal cut with sharpened tool, cutting key ways on a shaper, groove shaping, determining cutting feed and speed, as well as maintaining shaper machine. The finding are in line with Bell (1981) finding which emphasized that improper preparation of the teacher while in school can result to ineffectiveness due to incompetency. However, incompetency among instructor arose as a result of using obsolete equipment that are no currently invoke, thus making them incompetent.

The study also revealed that technical teachers require ethical conduct for skill improvement. The ethical conducts identified in the study include technical teacher avoidance of unethical conducts in educational practice and performance, teachers should adopt rational cost benefit analysis during instructional delivery, teacher should adopt strategies that provide the greatest amount of good consequence, teachers should accommodate students of varied cultural background and learning speed, teachers should demonstrate professional principles and code, teachers should demonstrate good relationship to students and core values of respect, responsibilities, integrity and honesty in instructional delivery. The finding is in line with Shirely (2014) who opined that teachers should demonstrate positive role model inside and outside the classroom to show exemplary behaviour. In the same vein, Sarup and Kathleen (2014) remarked that teachers must learn to commit themselves to institutional and behavioral practices that foster an ethical school culture which promotes core values of respect, responsibility, and honesty for self and other. If there ethical conducts are imbibe and practiced by teachers and students skills as outlined in machine shop operation will improve. The study revealed that teachers should adopt strategies that produce the greatest amount good consequences. Teachers should be encouraged to inculcate in students institutional and behavioural practices that foster ethnic school culture required in machine shop operation

Conclusion

The study highlighted the need for skill improvement and ethics by technical teacher in machine shop operation in technical colleges in Enugu State. The study revealed that there is need for technical teacher to be updated with current skills need in operating modern machines in lathe, milling and shaper machines and transcend such skills to students before graduation. The study also revealed that ethical conducts which is embedded in ethical theories, ethical models and principles must be incorporated to skill acquisition so as to improve skill as needed by industries and country of large.

Recommendations

The study recommends that;

1. Ethical theories, models and conducts should be incorporated into curriculum by the curriculum expert to form a guide role in the teaching of machines shop operations.
2. Skill improvement is needed in lathe, milling and shaper machine operations with relevant updated machine and equipment currently available in industries.
3. Technical teachers should be guaranteed the opportunity for training and retraining in these new machine tools like the CNC (computer numerical control) machines.

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