

Factors Affecting the Behavior of Engineering Students toward Safety Practices in the Machine Shop

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Abstract – *This study aimed to determine the factors that affect the behavior of engineering student toward safety practices in the machine shop. Descriptive type of research was utilized in the study. Results showed that most of the engineering students clearly understand the signage shown in the machine shop. Students are aware that they should not leave the machines unattended. Most of the engineering students handle and use the machine properly. The respondents have an average extent of safety practices in the machine shop which means that they are applying safety practices in their every activity in machine shop. There is strong relationship between the safety practices and the factors affecting behavior in terms of signage, reminder of teacher and rules and regulation.*

Keywords: *Safety Practices, Behavior, Engineering Students, Machine Shop*

INTRODUCTION

In the early twentieth century, psychology moved from studying the context of mind to studying overt behavior. Behaviorism is the school of psychological thought that focuses on describing and measuring only behavior – that which is observable directly through assessment instrument. The human behavior is facilitated by the integration of numerous processes within the body. The integration is provided by the nervous system, which include the brain, with the help of endocrine system (Recto, Mejico & Añonuevo, 2004).

Behaviors are the 'ingredient' that pulls everything together to lead to job completion. If a job goes well despite people behaving unsafely, their 'unsafe' behavior would be rewarded and repeated in the future. If it goes badly, with unwanted injuries, people would find the unsafe behavior punishing. Often, however, people do not get hurt when behaving unsafely, which reinforces the very behaviors most likely to hurt them ("Behavioral Safety", 2011).

Behavioral assessment and coaching skills are very important or somewhat important to their career growth. Environment includes all the conditions inside and outside an organism that in any way influence its behavior, growth, development or life processes except the genes (Acero et al., 2004).

Chemistry teacher spend considerable money and devote hours of time to provide laboratory experiences for their students. The quality, meaningfulness, and

effectiveness of laboratory activities in chemistry cannot be enhanced until they have better understanding of what really happen during them. Rather than control teacher and student variables, this study sought to investigate these as relate to the laboratory experience (Blonder et al., 2014).

A safe workplace is one where exposure to hazards is avoided or minimized. Without exposure to a hazard, no injury can occur. In a safe workplace, the atmosphere of safety is created through a constant awareness of safety and by educating people to know how to avoid or minimize personal exposure (Jones & Jones, 2000).

The positive results of maintaining safe workplaces are readily apparent; no injuries to people and no loss of equipment or production.

Hazard that cannot eliminate should be control first, by design and then by procedural means. Procedural means consist, in effect, in relying on employee to perform properly and safely. Use of procedure is a far less desirable means of accident prevention than is good design. Provided a rough indication of priorities that could be used for accident minimization and use of good procedures comes last (Hammer & Price, 2001).

There are many types of machines on campus that are used as part of research. Many of them can be hazardous including lathes, milling machines, table saws and drill presses and cause serious injury if not used safely ("Environmental Health and Safety").

The study focused on the respondents assessment in the factors affecting the behavior of engineering students in terms of the following variables: Signage, Reminder from teacher while within the machine shop area, and Machine handling, identify the extent of safety practices being applied by the engineering students, test the relationship between safety practices and the factors affecting the behavior, and to proposed an action plan to enhance the safety features of the machine shop.

The study would help faculty members to continue reminding the student to act safely while working in the machine shop. The result of the study could provide substantial information and more ideas for the researchers and students about factors affecting the behavior of the engineering students toward safety practices in the machine shop.

OBJECTIVES OF THE STUDY

The main purpose of the research is to determine the factors that affect the behavior of engineering student toward safety practices in the machine shop.

Specially, it attempted to identify the factors affecting the behavior of engineering students in terms of signage, reminder from teacher while within the machine shop area and machine handling; determine the extent of safety practices being applied by the engineering students; test the relationship between safety practices and the factors affecting the behavior; and propose an action plan to enhance the safety features of the machine shop.

Ho: There is no significant relationship between safety practices and the factors affecting the behavior.

LITERATURE REVIEW

Behaviorism emphasizes conditional reflexes as the elements of behavior and denies that existence of instincts or of in born tendencies but insists on learning behavior. Behaviorism uses stimulus-response connections or empirical approach. Psychology should study observable and measurable behavior not consciousness. It should stress the importance of learning and influence of environment. In order to understand human behavior, take into account what the environment does to an organism before and after it responds. Behaviorism explains the behavior through relationship of stimulus (events in the environment) and response (any muscular action, glandular activity of other identifiable behavior. Psychologist should study only activities that can be objectively observe and measure; prediction and

control should be the theoretical goals of psychology. (Recto, Mejico and Añonuevo, 2004).

Certain rules of conduct and procedure may be more critical than others, and if may be necessary to apply two different penalty levels for non-observance. Needs for most rules are generally apparent, so it is unnecessary to go into long, detailed explanations of why they have been imposed. Certain criteria should be observed in the preparation of safety rules includes the number of general rules should be kept to a minimum. Each rule should be clear and unambiguous. Rules for participating operation and for workers involved should be included in the procedures for conduct Person's behavior is predicted by his/her attitude toward that behavior and how he/she thinks other people would view them if they performed behavior. A person's attitude combined with subjective norms, forms his/her behavioral intention (Miller 2005).

The key area for any intervention of an organization's health and safety policy should be management's commitment and actions towards safety. Ultimately management's attitudes and behavior in terms of safety influence many aspects of safety behavior including the success of safety initiatives (Collinson, 1999).

Workers were involved in unsafe behavior because of: a lack of safety awareness; to exhibit of being 'tough guys'; work pressure; co-workers' attitudes; and other organizational, economic and psychological factors. The results substantiate the significant role of management; safety procedure; psychological and economic factors; self-esteem; experience; performance pressure; job security; and education as well as safety orientation and training. The influences of these factors on the safety behavior of workers are discussed along with implications of the research for management of the construction industry (Choudhry & Fang, 2008).

Organizational factors that influence the satisfaction, health, safety, and well-being of health care workers and ultimately, the satisfaction, safety, and quality of care for patients. Studies focusing on worker health and safety concerns affected by the organization and the physical work environment provide evidence of direct positive and/or adverse effects on performance and suggest indirect effects on the quality of patient care (Lundstrom et al., 2002).

METHODS

Research Design

This study used a descriptive method of research wherein the quantitative data were gathered using a

survey questionnaire to determine the factors that affect the behavior of engineering student toward safety practices in the LIMA machine shop.

Participants

The participants of the study were composed of total population of fourth year and fifth year Mechanical Engineering and Industrial Engineering students of Lyceum of the Philippines University – Batangas LIMA Campus who already experienced working at the machine shop.

Table 1. Distribution of Respondents

Course/Year	N	%	Male	Female
BSIE 4 th year	25	36.23	16	9
BSME 4 th year	10	14.49	9	1
BSIE 5 th year	23	33.33	12	11
BSME 5 th year	11	15.94	6	5
Total	69	100	43	26

Instrument

Researcher-made questionnaire was used as the instrument to determine the factors that affect the behavior of engineering student toward safety practices. The questionnaire is composed of two parts: first part is the factors affecting the behavior and second part is the safety practices. The questionnaire was validated by the adviser and an engineering professor through content validation.

Procedures

The researcher obtained the data and information through the use of questionnaire that were distributed to the Industrial and Mechanical Engineering students. The researcher also informed the respondents regarding the purpose and significance of the study. The researcher data were analyzed and interpreted.

Data Analysis

Data were analyzed using weighted mean, percentage, and Pearson Product Moment Correlation Coefficient. Weighted mean was used to analyze the most affecting factor in terms of signage, reminder from the teacher and rules and regulation to the behavior of the students toward safety practices. Percentage was used to determine the percent distribution of each factor in terms of signage, reminder from the teacher and rules and regulation to measure their extent of effect on the behavior of the students toward safety practices. Also percentage was used to determine the extent of safety practices

students possess in the machine shop. Pearson Correlation was used to determine the relationship of the factors in terms of signage, reminder from the teacher and rules and regulation and safety practices of students in the machine shop.

The given scale was used to interpret the result of the study: 4.50-5.00: Strongly Agree (SA); 3.50-4.49: Agree (A); 2.50-3.49: Moderately Agree (MA); 1.50-2.49: Disagree (D); 1.00-1.49: Strongly Disagree (SD)

RESULT AND DISCUSSION

Table 2. Safety Practices in the Machine Shop in Terms of Signage

	Signage	WM	VI	Rank
1.	I understand all the signage that shown in machine shop	4.45	A	1
2.	I clearly read the content of the signage	4.07	A	5
3.	I follow what is the content of the signage	4.19	A	2
4.	I kept my hand out of the machinery	4.09	A	4
5.	I read the operation and safety manuals before I used the machines	4.17	A	3
Composite Mean		4.19	A	

Table 2 shows the factors affecting the behavior of engineering students toward safety practices in the machine shop in terms of signage. Majority of the students agreed that they understand all the signage that are shown in machine shop which ranked first with a weighted mean of 4.45. Most of them also agree that they follow what is the content of the signage with a weighted mean of 4.19 and they read the operation and safety manuals before they use the machines with a weighted mean of 4.17 with a weighted mean of 4.09, respondents agreed that they kept their hand and other parts of his body out of their machinery ranked fourth. And, lastly is they clearly read the content of the signage with a weighted average of 4.07. The composite mean obtained 4.19 signifies that the students agree that signage factors affect their behavior toward safety practices.

The ranking denotes the order of the most affecting factor in the behavior of engineering student toward safety practices in the machine shop in terms of signage. The factor ranked first which is they understand all the signage that shown in machine shop it's because all the respondents have been already orient by their professor before their every activity

that affect the most in the behavior of these students, and last which is they clearly read the content of the signage is the least affecting factor because the some of the signage are not visible and dusty.

Table 3. Safety Practices in terms of Reminder from Teacher while within the Machine Shop Area

The teacher reminds me to:	WM	VI	Rank
1. Never to eat or drink in the machine shop	4.16	A	5
2. Never leave the machine unattended	4.38	A	1
3. Get first aid immediately for any injury	4.30	A	4
4. Report all accidents and injuries to your instructor immediately	4.35	A	3
5. Wear proper safety attire	4.36	A	2
Composite Mean	4.31	A	

Table 3 presents the factors affecting the behavior of engineering students toward safety practices in the machine shop in terms of reminder from teacher. Majority of the student agreed that they reminded by their teacher to never leave the machine unattended is ranked first with a weighted mean of 4.38. Most of them also agree that they are reminded by their teacher to wear proper safety attire with a weighted mean of 4.36. They also agreed that reminded by the teacher to report all accidents and injuries to your instructor immediately with a weighted mean of 4.35. Ranked fourth is they also reminded by the teacher to get first aid immediately for any injury with a weighted mean of 4.30. And, lastly is reminded by the teacher to never to eat or drink in the machine shop got a weighted average of 4.16. The composite mean obtained is 4.31 which signifies that the students agree that reminder from teacher affect their behavior toward safety practices.

The ranking denotes the order of the most affecting factor in the behavior of engineering student toward safety practices in the machine shop in terms of the reminder of the teacher. The factor which ranked as first is never leave the machine unattended because it is the most important matter that the students should not forget that affect the most in the behavior of these students and ranked last is to never to eat or drink in the machine shop is the least affecting factor because the student know that it is not a proper place to eat and also the canteen is far from the machine shop.

Table 4 shows the factors affecting the behavior of engineering students toward safety practice in the machine shop in terms of rules and regulation.

Table 4. Safety Practices in the Machine Shop in terms of Machine Handling

Machine Handling	WM	VI	Rank
1. I am wearing proper personal protective equipment included the eyes, ears, hands, and foot protection	4.28	A	3
2. I always clean up the work area before I leave	4.16	A	5
3. I am aware of the various machine controls, (start button, stop button, speed-change control) for each machine I authorized to operate	4.32	A	2
4. I always keep hands at a safe distance from moving machine parts	4.33	A	1
5. I remove my rings, watches, bracelets, pendants, neckties and other loose items, which may be caught in moving machinery.	4.22	A	4
Composite Mean	4.26	A	

Majority of the student agreed that they always keep their hands at a safe distance from moving machine parts ranked first with a weighted mean of 4.33. Most of them agree that they are aware of the various machine controls, (start, button, stop button, speed-change control) for each machine that authorized to operate with a weighted mean of 4.32. Wearing of proper personal protective equipment included the eyes, ears, hands, and foot protection ranked next with a weighted mean of 4.28. They also agreed that remove their rings, watches, bracelets, pendants, neckties and other loose items, which may be caught in moving machinery with a weighted mean of 4.22. Ranked lastly with the student agreed is that they always clean up the work area before he leave with a weighted mean of 4.16.

The ranking denotes the order of the most affecting factor in the behavior of engineering student toward safety practices in the machine shop in terms of rules and regulation. The factor which ranked first is that they always keep hands at a safe distance from moving machine parts because the students are aware to the possible accident that may happen if they disobey it that affect the most in the behavior of these students and last is they always clean up the work area before they leave the least affecting factor because most of the student is in rush for their next class.

Table 5 presents the extent of different safety practices that is applied by the engineering students in the machine shop. Majority of the student agree that they used the tools properly according to their function ranked first with a weighted mean of 4.39.

Table 5. Extent of Safety Practices being Applied by the Engineering Students in the Machine Shop

Safety Practices	WM	VI	Rank
1. I always follow the rules and regulation of the machine shop	4.36	A	2
2. I observe proper behavior during machine shop hours	4.26	A	3
3. I always consult the safety personnel every operation	4.14	A	5
4. I used the tools properly according to their function	4.39	A	1
5. I familiarize how machine are operated correctly	4.25	A	4
Composite Mean	4.28	A	

Most of them agree that they always follow the rules and regulation of the machine shop with a weighted mean of 4.36 and they observe proper behavior during machine shop hours with a weighted mean of 4.26. They also agreed that they familiarize how machine are operated correctly got a weighted mean of 4.25. And lastly they agreed that that they always consult the safety personnel every operation with a weighted mean of 4.14. Most of the respondents agree and have an average extent of safety practices in the machine shop with the weighted mean of 4.28 which means that they are applying safety practices in their every activity in machine shop.

Table 6 shows the relationship between safety practices and the factors affecting behavior.

Table 6. Relationship between Safety Practices and the Factors Affecting the Behavior

Factors Affecting the Behavior of Students	r-value	p-value
Signage	.457(**)	.000
Reminder from teacher	.687(**)	.000
Rules and Regulation	.803(**)	.000

** Correlation is significant at the 0.01 level (2-tailed).

There is a significant relationship between safety practices and the factors affecting behavior if correlation (or the r value) is at 0.01 level. Signage has high significant relationship with safety practices with r-value of 0.457. Reminder from teacher has high significant relationship with safety practices with r-value of 0.687. Rules and regulation has also high significant relationship with safety practices with r-value of 0.803.

There is a highly significant relationship between safety practices and the factors affecting the behaviour of the engineering students in terms of signage, reminder from teacher and rules and regulation in the machine as denoted by the computed p-values which are all less than the 0.05 level of significance. Therefore, the null hypothesis of no significant relationship is rejected. This signifies that the higher the factors that affect their behaviour of the students, there is a tendency that they would also have high safety practices inside the machine shop.

Table 7. Action Plan Relevant to the Improvement of safety practices of engineering students in the machine shop in terms of signage, reminder of teacher and rules and regulation

Objective	Activity	Responsible	Performance Indicator
Sustaining proper safety practices of the students before, during and after using the machine shop	Seminar about safety practices in using the machine shop	Teachers, Students, Safety officers	Zero Accident
Determining unsafe practices and risk of the students before, during and after using the machine shop	Conference among the students, teachers and safety officers	Teachers, Safety officers	Zero Accident
Revising, Implementing and Sustaining proper implementation of the revised rules and regulation implemented in the machine shop based on found unsafe practices of the students	Conference, Seminar and Safety Drill among students, safety officers and teachers about the revised rules and regulation.	Teachers, Students Safety officers	Revised Rules and Regulation
Designing and Posting appropriate signage in the machine shop and determining where in the machine shop these signage should be posted	Designing and Posting appropriate signage	Teachers, Safety Officers, Laboratory Technician	Posted appropriate signage in the machine shop
Improving, Implementing, and Sustaining right approach of teacher in implementing safety practices in the machine shop	Classroom visit during class hours and Seminar for teachers and safety officers of right approach in implementing safety practices in the machine shop	Teachers	Improved and implemented right approach

CONCLUSION AND RECOMMENDATION

Most of the engineering students clearly understand the signage shown in the machine shop. In terms of reminder from teacher while within the machine shop area, students are aware that they should not leave the machines unattended. In terms of Machine handling, most of the engineering students handle and use the machine properly. The respondents have an average extent of safety practices in the machine shop which means that they are applying safety practices in their every activity in machine shop. There is strong relationship between the safety practices and the factors affecting behavior in terms of signage, reminder of teacher and rules and regulation, therefore, null hypothesis is rejected.

Sustain proper safety practices already being performed by the students by conducting safety seminar discussing the proper safety practices in the machine shop. Determine unsafe practices of the students before, during and after using the machine shop by observing the behaviour of students with and without their consent. In this manner, safety officers will have the actual safety behaviour of the students and from these observations the safety officers should develop a more intensive safety rules and regulation and implement it in the machine shop. Check signage that are improperly located or have context problems, revise and determine appropriate signage in the machine shop, replace old ones if necessary.

Through an informative seminar, inform the instructor of the behaviour of their students in the machine shop and teach them of the right motivational approach and methods in able to implement good safety practices in the machine shop. Include the role of the teacher in monitoring the safety practices inside the machine shop.

For future researcher, they might consider studying the affect of the behavior in terms of difference on age and gender of the respondents.

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