

WATER DISPENSER: A UNIQUE INNOVATIVE DESIGN THAT MATTERS

Eugenio A. Ermac, PhD

Associate Professor II, Technology Area, College of Education
Cebu Technological University, Cebu City, Philippines

Nolasco K. Malabago, PhD

Associate Professor IV, Mechanical Engineering Department,
College of Engineering, Cebu Technological University, Philippines

Abstract

Any individual is basically moved to do a particular task when in need or when challenged by the environment (Amabile, 2013). Cebu Technological University had been experiencing scarcity of instructional equipment for the last decade due to budget constraint. To enhance its instruction for the students in refrigeration and air conditioning majors both for industrial technology and mechanical engineering, the study was conducted making use of stock scrap water dispenser. Innovative design, construction and function were validated and results revealed that the design of water dispenser was Highly Acceptable implying that the design meets the required competency (Friedman, 2003). It increases the students' performances during pre-test (moderately satisfactory and effective) to very satisfactory and highly effective in the post test after having a practical application on the use of the innovative water dispenser. Thus, an innovative design is recommended to be utilized and duplicated for similar use.

Keywords: innovation, water dispenser, design, equipment, coolers

INTRODUCTION

Bottled water has been a commodity all throughout the world, which is handy at places where people in numbers usually stay for relaxation and for other purposes. In emergency cases, the consumer public thinks that bottled water becomes the safest way to drink water. Voluminous consumption of bottled water daily spurs the use of water dispensers and coolers at homes and in offices. In the City of Cebu, vending machines are growing in numbers, mostly especially in conspicuous places such as: parks and schools – dispensing cold water and even hot coffee or chocolates. Health compliance and other issues such as maintenance of the units become

a concern that the city government has to address. This calls for the attention of the dispenser owners to find persons capable of installing, servicing and maintaining the units. Because of these felt needs, Cebu Technological University, being known to offer Technology Education in central Visayas, emerges as the avenue for training technicians to be adept in maintenance, installation and servicing of the dispenser units.

To carry out the work implements as described by Prosser & Quigley (1949) on his theory of environment habits (Theory 3: Prosser's 16 Theories of Vocational Education), the professors of the refrigeration and air conditioning technology of Cebu Technological University have to search ways in producing the training equipment due to its limited supply and meager funding allocation. Innovations are, then, made on dispensing units that are unserviceable and place on the disposal inventory making them appear useful and more valuable than to be placed as a scrap in a junkyard. This shows the resiliency of the Filipinos to still think of possibilities to make these dispensers functional, not discounting the obvious obsolescence of these units.

SHORT LITERATURE OF THE STUDY

Driven by the principle of Prosser & Quigley (1949) on environment habits, individuals are trained in school, equally similar with the industry. Hence, the lack of resources to train professors at Cebu Technological University Main Campus to put into use the unserviceable water dispensers in the disposal inventory of the supply office, which consequently tests their patience to enhance its status to make it serviceable again, by means of doing needed repairs. In schools, innovations are made to fit in the skill competencies of students in servicing, installation and maintenance of peso-water dispensers placed in different accessible corners or kiosks in the campus. This is what Amabile (2013) calls as the componential theory of creativity. Any individual is basically moved to do a particular task when needed or when challenged by the environment, in order to be more adept and be creative in responding to inequities of life.

In the context of defining product for used by individual or society, an in-depth collaboration of students is given focus (Adams, 2005). Thus, this study finds it more convincing in connection with the study of Ong and Yu (2002) on the ergonomics of design, allowing the Filipino public to use the water dispenser with comfort, since; the product sold at the market does not match with Filipino psychometrics. Moreover, its design process includes specific entities needed in the construction, function and acceptability of the product, which largely depends on the process that converts prevailing conditions being challenged and changed to what is preferred (Friedman, 2003). The innovative water dispenser is made

according to how the product is cross-checked by its capacity (product performance) and functioning methods.

OBJECTIVES OF THE STUDY

The study assessed the value and effectiveness of the innovative design of water dispenser in performing mechanical and electrical activities. Specifically, it sought to answer to the following objectives: (1) determine the acceptability of the innovative design of water dispenser as revealed by instructors' rating in terms of design, construction, and function, (2) analyze the degree of effectiveness of the dispenser as revealed in the mean difference of pre-test and post-test scores of both the Experimental Group and the Controlled Group, (3) identify the significant mean difference of pre-test scores of the Experimental Group and Controlled Group, and (4) find the significant mean difference of post-test scores of the Experimental Group and Controlled Group.

METHODS AND MATERIALS

The study uses quantitative method of research that describes the variables under study, that is, from the preparation, construction, testing and structure of the dispenser until it has been operationalized. Inferences are used to investigate the effectiveness of the trainer as a tool in the technology instruction. The study uses the matched-pair design in choosing the subjects and is divided into two – the experimental and controlled group, in validating the effectiveness of the trainer. The instructors and industry practitioners are also purposively chosen to validate the acceptability of the trainer. The responses are, then, analyzed and results are interpreted.

RESULTS AND DISCUSSION

The study is divided into three components namely acceptability, effectiveness and inferences. Acceptability of the Innovative water dispenser as to design, construction, and function are looked into whether the innovated dispenser conforms to standard as described by Friedman (2003)

On Acceptability

The Design

Disclosed in the study is that the affordability of cost of material and accessories is moderately acceptable (4.00). The rest of the aspects of the design that includes safety and maintainability are validated as highly acceptable with a mean of means of 4.70 and a standard deviation of 0.29.

The Construction

On the aspects of construction, the dispenser is described verbally as highly acceptable with a mean of means of 4.44 and a standard deviation of 0.21. Notably, adequacy of space for wiring performance receives a mean of 4.00 described as moderately acceptable.

The Function

Validation on function receives a mean of means equal to 4.23 – being close to the lower boundary of highly acceptable. This is attributed to the fact that the coin slot does not accommodate newer released peso coin. Also, the flow control is not accessible for any change of the amount of water that would fill the glass at a particular level. As per interview, there is also a need to concede such part for economical reasons. Adjustments must be made by a technician or person who has skills of doing so.

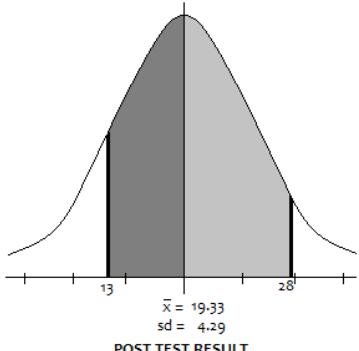
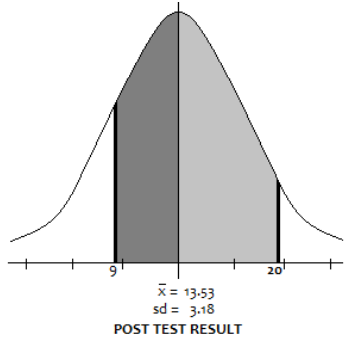
On the Degree of Effectiveness

As described by Adams (2005), to give more impact on the output of the design, students are made to validate the degree of effectiveness of the innovated dispenser. Pretest - posttest design is administered to look into the test effectiveness of the innovated design. Analytically both the experimental and control group begin with a matched pre – test result. It can be noted that there exists a larger value on the post test of the experimental group (from a lowest of 5 stretched to 15 and conversely from a highest of 16 to 28 listed on Table 1). This notable effect is supported on Table 2, *Test on significant difference between pretest result and post test result of the experimental and control groups*. Inferentially, the pretest results have failed to reject the null hypothesis of significant difference. This means that the occurrence of such difference is taken care of the alpha level. Besides, these students are matched carefully to do away with biases. But undeniably the difference is found on the post test results indicates a change that has surpassed that failed to reject with an indicated t – value of 4.207.

This means that the innovative water dispenser has contributed much to the skills competency of the Refrigeration and Air Conditioning (RAC) students. The result implies that uncertainty (as described by a deviation of 4.29) reduces after the innovated dispenser is used by the subjects.

Table 1 Distribution of Test Results of Experimental Group

	experimental		control	
	POST	PRE	POST	PRE
1	28	16	20	15
2	25	14	18	14
3	24	14	17	10
4	22	11	16	10
5	22	11	15	9
6	21	10	14	9
7	19	10	13	8
8	19	9	13	8
9	18	8	13	7
10	17	8	11	6
11	17	7	13	6
12	16	7	10	6
13	15	6	10	5
14	14	6	11	5
15	13	5	9	4
TOTAL	290	142	203	122
Mean	19.33	9.47	13.53	8.13
Std Dev	4.287	3.2704	3.1818	3.1818

On Test of Significant Difference

Inferences are drawn from the posttest and pretest results of test scores. The pretest scores of the two groups are matched as evidence by t-test for two related samples failing to reject the null hypothesis. The test statistics on the posttest has showed significant difference on the validation of the innovated water dispenser. Indicatively the use of the innovated dispenser provides an in-depth impact on study that benefits the individual, groups or society (Adams, 2005).

Table 2 Test on Significant Difference

t-Test: Post – test Scores			t-Test: Pre – test Scores		
	<i>Experimental</i>	<i>Control</i>		<i>Experimental</i>	<i>Control</i>
Mean	19.333	13.533	Mean	9.467	8.133
Variance	18.381	10.124	Variance	10.695	10.124
Observations	15	15	Observations	15	15
Pooled Variance	14.252		Pooled Variance	10.410	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	28		df	28	
t Stat	4.207		t Stat	1.132	
P(T<=t) one-tail	0.000		P(T<=t) one-tail	0.134	
t Critical one-tail	1.701		t Critical one-tail	1.701	
P(T<=t) two-tail	0.000		P(T<=t) two-tail	0.267	
t Critical two-tail	2.048		t Critical two-tail	2.048	
Decision: Reject the null hypothesis			Decision: Fail to reject the null hypothesis		

CONCLUSION AND RECOMMENDATION

Based on the results, there is enough evidence to prove that the innovative water dispenser has contributed much on the students' Refrigeration and Air Conditioning (RAC) competencies. It is then recommended that fabrication of more units be done to increase the ability of the student in troubleshooting and repair of such unit that encompasses the basic competencies in refrigeration and air conditioning technology in Cebu Technology Main Campus.

References:

- Prosser, C. A. & Quigley, T. H. (1949). *Vocational education in a democracy*. American technical society, Chicago, Illinois.
- Amabile, T. M. (2013). *Componential theory of creativity*. Harvard Business School, Sage Publications.
- Adams, K. (2005). *The Sources of Innovation and Creativity*. National Center on Education and the Economy (NCEE). *Research Summary and Final Report*
- Ong, R., et. al. (2002). *An ergonomic stand-type water dispenser for Filipino users*. *Undergraduate Research Projects*, De La Salle University.
- Friedman, K. (2003). *Theory construction in design research: criteria: approaches, and methods* Norwegian School of Management, Postboks 4676, Sofienberg, 0506 Oslo, Norway