

Testing the Awareness of Hazardous Nature of Printmaking Materials among Printmaking Students in Traditional and Non-Toxic Printmaking Programs

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Objective: The literature documents and supports the fact that many art supplies contain toxic substances which are considered harmful to the health of artists, teachers, and students. The goal of this study is to investigate printmaking students awareness of hazardous printmaking materials. **Methods:** A questionnaire consists of seven questions was mailed to a 130 students from non-toxic printmaking programs, and 130 students from traditional printmaking programs in 10 liberal arts colleges and universities in the United States and Canada (5 universities for the safe printmaking program, and 5 for the traditional program). A total of 189 printmaking students responded to the survey instrument. The questionnaire sought information on demographic characteristics of respondents, and the awareness of students of the hazardous nature of printmaking materials. Information collected from the questionnaire was coded for the purpose of entering it into a computer for statistical analysis (SPSS Program). **Results:** It was found that printmaking students in both programs were moderately aware of the toxic nature of printmaking materials, but the *t*-test analysis showed non-toxic printmaking students were more aware than traditional printmaking students. **Conclusion:** This study pointed to the importance of increasing awareness of students to art materials in the traditional program.

Key words — non-toxic, traditional, awareness, student, printmaking, program

INTRODUCTION

Chemicals, solvents and other toxic materials used by artists and craftspeople are composed of hazardous chemicals and present a threat to their life. Chemical hazards include dust, fumes, mists, solvents, acids, vapors, gases, and liquids. As artists become more aware of the potential toxicity of the chemicals used in art, they are also concerned about the effects of these hazardous art materials on themselves and the environment.¹⁾

Dangerous art materials and procedures are not new but have existed for centuries, and the effects of certain kinds of work upon health have been observed throughout history. The first indication of concern about art hazards appeared in the 18th cen-

tury when Bernardo Ramazzini, the father of occupational medicine, published his book “Diseases of Workers” in 1713.²⁾ This was the first intensive study of common diseases associated with occupational groups, especially craftspeople. Ramazzini described the diseases of potters, painters, stone cutters, coppersmiths, and other crafts.²⁾ Physicians have speculated that many of the old masters experienced illness and even death because of the materials they used. For instance, Francisco Goya (1746–1828) suffered excruciating illness. An analysis of his paintings has confirmed his massive use of lead white, lead red, and mercury containing cinnabar. Medical historians have attributed his sickness to lead poisoning, known as plumbism. Goya suffered the symptoms of depression, paranoid thinking, impaired hearing and vision, coma, and personality changes.³⁾ Peter Paul Rubens (1577–1640), Pierre-Auguste Renoir (1841–1919), and Raoul Dufy (1877–1953) are other historical examples of health problems associated with art materials. All suffered

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Table 1. Questions Used in the Questionnaire

1-	How often have you received formal training or information about hazardous art materials and substances that you used in printmaking?
2-	How often do you use chemical splash goggles, gloves, aprons, and a local exhaust ventilation system when working with printmaking chemicals and materials?
3-	How frequently do you eat or drink while working in the studio?
4-	How much do you print/work at home?
5-	How frequently do you engage in different printmaking techniques that require the use of different chemicals and solvents in the same room?
6-	How important do you consider researching safe materials in printmaking?
7-	Who do you feel is responsible for your health and safety in the work place?

from crippling arthritis; and all were known to use pigments from toxic metals such as antimony, arsenic, cadmium, cobalt, chromium, lead, manganese, and mercury. When these metals are taken into the body, they can inhibit enzymes, destroy proteins, and increase susceptibility to infections.⁴⁾

Bertram Carnow has suggested that Van Gogh's insanity might have been caused by lead poisoning, and he has speculated that the blurring of stars and the halos around lights in Van Gogh's later paintings might have been the result of swelling of the optic nerve, a possible effect of lead poisoning.⁵⁾ Van Gogh used lead containing Naples yellow and several other highly toxic pigments; and there is documentation that Van Gogh used to swallow paint.⁶⁾

Non-toxic printmaking marks the rebirth of printmaking as a vital, creative force within the art education and printmaking world. This program replaces printmaking materials that contain toxic chemicals with adequate substitutes that are safe for printmaker and students to use. The non-toxic approach to printmaking education has been implemented in only a few fine art departments in the United States, but it is widespread in Canada and the United Kingdom. Non-toxic printmaking is a cost-effective program which does not require sacrifice of the prints' quality.⁷⁾ Most institutions, which maintain traditional printmaking practices, are forced to spend thousands of dollars upgrading their studios to acceptable levels of safety. This expense is no longer necessary because safe printmaking practices do not require the use of the protective equipment, such as expensive respirators and a fume-exhaust system, since they utilize only safe printmaking materials.⁷⁾

The specific aim of this study is to examine the awareness of printmaking students to the hazardous nature of printmaking materials in traditional and non-toxic printmaking programs. The motivation be-

hind this investigation is to generate more interest in the non toxic program.

MATERIALS AND METHODS

Methods — This research was carried out in two parts. Part one was done prior to the collection of data, and it involved contacting the directors of the printmaking departments by E-mail. The researchers explained to the participants the nature and purpose of the study, described potential benefits of the research and assured their information privacy and confidentiality. This helped in gaining access to the institutions that were selected to participate in the study, and to request their permission to send the questionnaire to the printmaking students under their supervision.

The questionnaire was developed to collect data on the level of awareness regarding the hazardous nature of printmaking materials. The questionnaire was mailed to a 130 students from non-toxic printmaking programs, and 130 students from traditional printmaking programs in 10 liberal arts colleges and universities in the United States and Canada, (5 universities for the safe printmaking program, and 5 for the traditional program). A total of 189 printmaking students responded to the survey instrument. Students were asked to answer 7 questions listed in Table 1.

Statistical Analysis — Information collected from the questionnaire was coded for the purpose of entering it into a computer for statistical analysis (SPSS Program). Data collected helped in calculating the frequency distribution, means, standard deviations, and percentages in order to provide a descriptive analysis of the responses. Demographic information was reported to describe the sample of printmaking students in traditional and non-toxic

Table 2A. Demographic Characteristics of the Students

Characteristics	Traditional		Non-toxic		Total in both programs	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Program type	101	53.4	88	46.6	189	100.0
Gender:						
Male	36	52.2	33	47.89	69	36.5
Female	65	54.2	55	45.8	120	63.5
Major:						
Printmaking	36	46.8	41	53.2	77	40.7
Graphic Design	14	50.0	14	50.0	28	14.8
Communication	10	100.0	—	—	10	5.3
Art Education	3	21.4	11	78.6	14	7.4
Painting	6	66.7	3	33.3	9	4.8
Fine arts	25	78.1	7	21.9	32	18.9
Sculpture	1	33.3	2	6.7	3	1.6
Photography	4	57.1	3	42.9	7	3.7
Ceramics	2	66.7	1	33.3	3	1.6
Illustration	—	—	6	100.0	6	3.2

Table 2B. Demographic Characteristics of the Students

Characteristics	Traditional		Non-toxic		Total in both programs	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Age	25.62	7.01	25.50	5.86	25.64	6.49
Years experience	1.89	2.38	1.60	2.08	1.76	2.24

n = 189.

programs. *t*-Test and crosstabs tests were applied to compare between traditional and non-toxic printmaking methods.

RESULTS

Tables 2A and 2B present the demographic characteristics of students for both traditional and non-toxic printmaking programs. To test the awareness of the hazardous nature of printmaking materials among printmaking students in both traditional and non-toxic printmaking programs, Students were asked to answer 7 questions in a questionnaire that provides information about Awareness (Table 1).

The first five questions were combined together into one variable called awareness. The scale for the five questions were 1 to 5 where 1 indicates not aware and 5 indicates very aware. The students' scores in response to the five questions were added together to constitute one score, which converted the scale from (1 to 5) to (6 to 30), where 6 equals not aware, and 30 equals very aware. Comparison of the

means and *t*-test was computed for this variable (awareness) to investigate whether there was a difference between the traditional and non-toxic printmaking students' responses regarding their awareness of hazardous printmaking materials. The results are reported in Tables 3 and 4.

Question 6 dealt with the importance of researching safe materials in printmaking. The scale for this question was from 1 to 4, where 1 indicates that such research is not important (not aware) and 4 indicates that it is urgent (very aware). A comparison of the means and *t*-test was computed, as shown in Tables 5 and 6.

Question 7 dealt with the responsibility for students' safety in the studio. Crosstabs and a chi-square test were performed to determine whether there was a difference between the traditional and non-toxic printmaking students' responses. The results are reported in Tables 7 and 8.

Table 3. Comparison of Means for the Level of Awareness of Traditional and Non-Toxic Printmaking Students^{a)}

Variable (awareness)	<i>n</i>	Mean	S.D.
Traditional	101	18.52	2.59
Non-toxic	88	19.71	2.55

a) Scale based on level of awareness: Low awareness = 6 to 9, moderate awareness = 10 to 20, high awareness = 21 to 30.

Table 4. *t*-Test for Equality of Means for the Level of Awareness of Traditional and Non-Toxic Printmaking Students

Variance	<i>t</i> -Value	df	2-tailed significance (p)
Equal	-3.17	187	0.002
Unequal	-3.17	184.21	0.002

Table 5. Comparison of Means for the Importance of Researching Safe Materials in Printmaking

Variable (q6)	<i>n</i>	Mean	S.D.
Traditional	101	2.97	0.073
Non-toxic	88	3.27	0.075

Table 6. *t*-Test for Equality of Means for the Importance of Researching Safe Materials in Printmaking

Variance (q6)	<i>t</i> -Value	df	2-tailed significance (p)
Equal	-2.86	187	0.005
Unequal	-2.86	185.45	0.005

DISCUSSION

Our study indicates that, printmaking students in both non-toxic and traditional printmaking programs were moderately aware of the toxic nature of printmaking materials, but further analysis with the *t*-test analysis showed non-toxic printmaking students were more aware than traditional printmaking students.

The results in Table 3 show that in the traditional printmaking program where *n* = 101, the students scored a mean of 18.52 and a standard deviation 2.59. In the non-toxic printmaking program, where *n* = 88, students scored a mean of 19.71 and a standard deviation of 2.55. Findings suggest that students in both traditional and non-toxic printmaking programs were moderately aware of the hazardous nature of printmaking materials, since both scored a mean range between 10 to 20. The findings also clearly demonstrate that non-toxic printmaking students were more aware than traditional printmaking students since they registered a higher score than traditional students. *t*-Test results of *p* < 0.05, in Table 4, indicate there is a significant difference between traditional and non-toxic printmaking students in terms of their awareness of hazardous printmaking materials and processes.

Regarding question 6, results in Table 5 show that traditional printmaking students scored a mean of 2.97 and a standard deviation of 0.073, while non-toxic printmaking students scored a mean of 3.27

Table 7. Crosstabs for the Responsibility for Students' Safety in the Studio

		Q7					
		University	Department	Instructor	Student	All of them	Total
Protype:							
Traditional	Count	2	3	1	9	86	101
	%	2.6	3.0	1.0	8.9	85.1	100.0
Non-toxic	Count	5	1	7	4	71	88
	%	5.7	1.1	8.0	4.5	80.7	100.0

Table 8. Chi-Square Test for the Responsibility for Students' Safety in the Studio

Chi-square	<i>t</i> -Value	df	significance (p)
Pearson	9.29	4	0.054
Likelihood ratio	9.95	4	0.041
Mantel-Haenszel test for linear association	1.876	1	0.171

and a standard deviation of 0.075. The results indicate that students in both programs agree that researching for safe printmaking materials to replace the hazardous traditional methods is an important matter which is an indicator of the students' awareness. The *t*-test that was done to investigate the difference between the two means showed $p < 0.05$, which means there was a significance difference in the mean of question 6 between the students in the traditional and in the non-toxic printmaking programs (Table 6).

Question 7 results in Table 7 show that 85.1% of the traditional printmaking students believe that safety in the studio is a shared responsibility between themselves, the university, the department, and the instructors. On the other hand, 80.7% of the non-toxic printmaking students believe the same. This result indicates that students in both programs are aware that they have to do their share of responsibility to maintain their safety. The chi-square results (Table 8) show $p > 0.05$, revealing no significant difference between the traditional and non-toxic printmaking students' responses.

Printmaking educators noticed that for decades the practice of traditional printmaking has undergone a decline in educational programming. Educators concluded that this decline was due largely to occupational health and safety risks as well as environmental concerns.⁷⁾ After considering toxicity issues, many printmakers may not see any value in putting their health at risk for the sake of pursuing traditional teaching. This factor stunts the potential growth of printmaking and has most certainly led to the demise of printmaking programs at art education institutions around the world. In some countries, such as the United Kingdom, health and safety legislation is now so stringent that printmaking teachers are given only two choices, either close down the printmaking departments or change to non-toxic methodologies.⁸⁾

In October 1996, Wyllie, an artist, administered a "printmaking in art education" survey to determine the position of printmaking in the education system. Ninety questionnaires were sent to 82 printmaking institutions in the United Kingdom to find out how things had changed over the last three years, and to determine the current situation of printmaking in undergraduate and graduate institutions in the United Kingdom. The findings revealed that one-fourth of the respondents reported a decrease in the number of students in the printmaking departments, and that

the 38% increase in the tuition fee and costs of materials deterred 40% of the students surveyed from studying printmaking.⁹⁾

While progress has been made in the area of awareness of hazardous art materials and their effect on the body, there is a need to do further research and investigation to document the problem in the printmaking area, and to provide a radical solution to eliminate using hazardous art materials in the studio. This study covered this need, since the non-toxic printmaking program is considered a solution for printmaking hazard control, and it constructed as clear a picture as possible about the new approach in printmaking.

Our study indicates that awareness of art students in the non-toxic program is more than those in the traditional program. Based on this, it is hoped this study will generate more interest in the art of printmaking within the art education world. Because of the versatility and cost effectiveness of this new, safer approach to printmaking, many printmaking departments might be encouraged to adopt and apply the safe printmaking procedures in their curriculum. Additionally, more high school students might be encouraged to study printmaking at the university level and continue to use safe approaches after they graduate.

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