

## Critical Thinking Skills of the Industrial Technology Students at the Pangasinan State University

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*Abstract. This study investigated the students' basic knowledge and skills in professional drawing and teaching at the Pangasinan State University – Lingayen Campus (PSU-LC) during the 2019 – 2020 school year. This study's populations included one hundred (100) male freshmen and one hundred (100) female freshmen majoring in Industrial Technology. There were a total of two hundred (200) respondents. The data was analyzed using a descriptive sample and inferential statistics. The t-test was used to test the hypothesis, with a 0.05 degree of significance. The study's main finding was as follows: the course contents in a technical drawing were achieved by freshmen, The instructional materials used in developing the basic knowledge and skills in technical drawing were sufficient, as viewed by the male and female freshmen, and the techniques used in developing the basic knowledge and skills in technical drawing and instruction among the freshmen were successful. Since the problems experienced in acquiring basic knowledge and skills in technical drawing and instruction among freshmen were moderately severe, remedial steps to mitigate the problems encountered in acquiring basic knowledge and skills in technical drawing and instruction among freshmen as viewed by male and female freshmen were reasonably important. Based on the results and assumptions reached, the following suggestions are made: the freshmen should continue to achieve the course material of technical drawing, the teachers should continue to optimize the use of successful techniques used in improving the basic knowledge and skills in technical drawing and instruction among the freshmen, The teachers and freshmen must ensure the adequacy of resources used in acquiring expertise and skills in professional drawing; the moderately severe problems found by the male and female freshmen must be addressed immediately by the authorities and themselves; and the teachers and freshmen should take the requisite steps to reduce the problems encountered in obtaining the basic knowledge and skills in technical drawing and teaching that are discovered to be required.*

*Keywords: Industrial Technology, Technical Drawing and Instruction, Pangasinan State University.*

## INTRODUCTION

There is a great need to improve the teaching-learning process at the college level because of the many changes in all aspects of human life. The instructors are facing great challenges as well as opportunities in bringing enlightenment to the youth on the conditions in the Philippines and in the application of the appropriate and effective approaches and strategies in using instructional materials. Any change in the curriculum involves the instructors. A good instructor recognizes the importance of the role he plays in shaping young architects' minds for tomorrow's decision. Instructors must know how to keep up with the increasing complexity of his role. As an adage in the profession runs a good instructor is one who seeks to improve him constantly on the job. To have effective and functional instruction, a continuing study of its objectives, content, and methods of instruction, instructional materials, and evaluation techniques should be made. The instructors should not be spared from assessment for he is the very agent of change in so far as the welfare of the youth is concerned.

Through this study, the instructor will be appraised of his position in the program so he knows when and how to improve on by upgrading his competencies along with giving instructions and introducing new ones to his students and developing consciousness on how to use art materials among his students. He will also be appraised of the problems of the students in doing their projects so that before these problems become unmanageable, they may be corrected by appropriate remedial measures. The instructors themselves can be guided by the problem of the students as well as their difficulties. With a more objective outlook and deeper insight on the problem and causes of the problem, the teaching-learning situation can be improved. The instructor becomes more of an inquirer, clarifier, and challenger instead of a mere giver of information in the classroom. For the instructors in the content areas, that they share the responsibility of providing students opportunities to enhance their ability. Besides, the results may serve as a reference for those who want to enter the world of the teaching profession concerning giving instructions to students. They would start collecting and modulating ideal instructional references for the ultimate attainment of the goals in teaching. Furthermore, this research may serve as a foundation for a greater understanding and knowledge of the basics of scientific drawing instruction, garnering the assistance and participation of all parties involved, whether interested or not. The most significant contribution of this study's result is perhaps in the lives of all dedicated instructors who have chosen the teaching profession as a lifelong

commitment. Thus, this study could be effective as it triggers concerted efforts for the overall improvement of the development of basic knowledge and skills in technical drawing and instruction. Finally, this study would challenge other researchers to conduct similar studies towards the attainment of quality education.

## METHODOLOGY

The descriptive normative survey approach was used in this study's analysis [8] [9]. It is analytical in the sense that it represented and investigated the current state of fundamental knowledge and skills in technical drawing and instruction at the PSU, during the school year 2019-2020. It is also normative in the sense that the data gathered were interpreted in terms of the criteria observed in instructing alt. freshmen along with technical drawing. The descriptive analysis approach is a systematic effort to observe, interpret, and record the current state of something, group of people, collection of circumstances, or other phenomena that a researcher wants to investigate [1].

### Locale and Population of the Study

This study's ranges and limitations were limited to basic knowledge and skills in technical drawing and teaching at PSU-LC in 2019-2020. This study's populations were surveys of one hundred (100) male freshmen and one hundred (100) female freshmen from the PSU-LC for the 2019-2020 academic year. There were a total of two hundred (200) respondents.

### Data Gathering Techniques

In gathering the shreds of evidence needed to answer the specific problems of the study, the questionnaire [2] was employed by this researcher, supplemented and cross-checked by library research, and participant observation. In the preparation of the questionnaire, the researcher reviewed questions from similar researches. the researcher also made an exhaustive and careful study on the principles of questionnaire construction. The items in the instrument were the results of the researcher's personal-participation-observation, readings, and consultation with knowledgeable people.

### Treatment of Data

The data that was gathered from the questionnaire were classified, tallied, tabulated, analyzed, and interpreted. Frequency distribution, percentage, and average weighted mean were used to present the data vividly on tables. The frequency distribution is a table that displays the number of cases in each category [3].

**RESULTS AND DISCUSSIONS**

The data were analyzed, presented in tables, and discussed accordingly.

**The Level of Achievement of the Course Content in Technical Drawing among Freshmen**

Table 1 reveals the comparative data on the level of achievement of the course content in a technical drawing among freshmen as perceived by the male and female freshmen in the PSU-LC. The total average weighted mean was 2.49 or achieved. When taken together, the course contents together with their weighted means were: techniques of line

sketching, 2.70 or achieved lettering styles; 2.44 or achieved; orthographic sketching, 2.47 or achieved; pictorial sketching, 2.48 or achieved; and geometrical construction, 2.34 or achieved. A t-test was used to see whether there was a substantial gap in attitudes between male and female freshmen at PSU-LC on the level of achievement of course material in a technical drawing among freshmen.

**Table 1**  
**Comparative Data on the Level of Achievement of the Course Content in Technical Drawing Among Freshmen at the PSU-LC as Perceived by the Male and Female Students**  
 N=100 Male, 100 Female, 200 Respondents

Objectives	Male		Female		Average	
	WM	DE	WM	DE	WM	DE
1. Technique of line sketching	2.77	A	2.63	A	2.70	A
2. Lettering styles	2.47	A	2.41	A	2.44	A
3. Orthographic sketching	2.35	A	2.59	A	2.47	A
4. Pictorial sketching	2.42	A	2.54	A	2.48	A
5. Geometrical construction	2.31	MA	2.37	A	2.34	A
Average Weighted Mean	2.46	A	2.51	A	2.34	A

tc = 0.522  
 t.05.8df = 2.306  
 Result: Not Significant  
 Decision: Accept Ho

There was no noticeable difference between male and female freshmen's expectations of the degree of accomplishment of the course material in a scientific drawing at PSU-LC. This was shown by the computed value of t of 0.522 which was less than the critical value of t on the table of 2.306 at 0.05 level of significance for 8 degrees of freedom.

Their perceptions were almost the same. Therefore, the decision was to accept the hypothesis. The computed value of t is not significant because it is less than the critical value of t on the table. The tested and agreed null hypothesis notes that there is no substantial gap in expectations of male and female freshmen at PSU-LC on the level of achievement of course material in a professional drawing among freshmen.

Evidently, in the data presented in the level of achievement of the course content in a technical drawing among freshmen, there were numerical differences between the perceptions of the two

groups of respondents but they were not enough to create a significant difference at 0.05 level of significance. The findings meant that the instructors did their duties by devoting themselves to the development of intellectual freedom. They were able to free the minds of their students from the shackles of unthinking conservatism and made them willing to think independently thus they were able to achieve the contents of the course. The findings collaborate with what Luzadder [4] said that college students get along much faster if they can manage to observe and apply the patterns of technical drawing. They cannot apply these unless they achieved the course contents. The very foundation of democratic education is the requirement that every learner in all levels should be allowed to achieve as fully as possible the contents of the course of their choice and develop as possible the powers given them by nature.

**Degree of Effectiveness of the Strategies Used in Developing the Basic Knowledge and Skills in Technical Drawing and Instruction**

Table 2 divulges the comparative data on the efficacy of the techniques used in developing basic knowledge and skills in technical drawing and instruction among freshmen at PSU-LC, as viewed by male and female freshmen. The average weighted mean was 2.56 or effective. When paired together, the techniques used in improving basic knowledge and skills in technical drawing and instruction among freshmen were weighted. the problem: solving, 2.50; lecture/discussion, 2.68; demonstration, 2.73; and paper and pencil test/observation, 2.56

A t-test was used to see whether there was a substantial gap between attitudes between male and female freshmen at PSU-LC on the degree of efficacy of the techniques used in improving practical knowledge and skills in technical drawing and instruction among the freshmen. There was no substantial variation in expectations of the degree of efficacy of the techniques used in improving the basic knowledge and skills in professional drawing and teaching among the freshmen at PSU-LC. This

was shown by the computed value of t of 0.640, which was less than the critical value of t on the table of 2.447 at 0.05 level of significance for 6 degrees of freedom

Their perceptions were almost the same. Therefore, the decision was to accept the hypothesis. The computed value of t is not significant because it is less than the critical value of t on the table. The tested and accepted null hypothesis states that there is no significant difference in the perceptions of the nude and female freshmen in the PSU-LC on the degree of effectiveness of the strategies used in developing the fundamental knowledge and skills in technical drawing and instruction among the freshmen.

Classroom instruction cannot be accomplished with the method alone; requires some particular teaching as well. Different methods call for different techniques although both are basic factors in learning. A good teaching technique is a necessary part of effective instruction. The process enhances student's learning and facilitates teaching with the use of appropriate strategies. The findings of this study collaborate with this.

**Table 2**  
**Comparative Data on the Degree of Effectiveness of the Strategies Used in Developing the Basic Knowledge and Skills in Technical Drawing and Instruction Among the Freshmen at the PSU-LC as Perceived by the Male and Female Students**

N=100 Male, 100 Female, 200 Respondents

Objectives	Male		Female		Average	
	WM	DE	WM	DE	WM	DE
1. Problem solving	2.46	E	2.54	E	2.50	E
2. Letter/Discussion	2.67	E	2.69	E	2.68	E
3. Demonstration	2.74	E	2.72	E	2.73	E
4. Paper and pencil test/observation	2.50	E	2.62	E	2.56	E
Average Weighted Mean	2.59	E	2.64	E	2.62	E

tc = 0.640

t.05.6df = 2.447

tc < t.05.

Result: Not Significant

Decision: Accept Ho

**Level of Adequacy of Instructional Materials Used in Developing the Basic Knowledge and Skilled in Technical Drawing and Instruction**

Table 3 shows the methodological results on the use of the t-test to determine whether there is no substantial gap between the views of male and female freshmen at PSU-LC on the degree of adequacy of educational resources used in learning basic

information and skills in professional drawing. The average weighted mean was 2.49 or adequate. The instructional materials together with their weighted means were: textbooks and reference books, 2.49 or adequate; posters and flip charts, 2.48 or adequate; charts, 2.58 or adequate; chalkboard, 2.73 or adequate; model plates, 2.54 or adequate; drawing tools and materials, 2.63 or adequate; drawing tables,

2.51 or adequate; and overhead projector, 1.94 or moderately adequate.

No significant difference was evident between the perceptions of the male and female freshmen in the PSU-LC on the level of adequacy of educational materials used in developing fundamental scientific drawing expertise and skills. This was shown by the computed value of  $t$  of 0.248, which was less than the critical value of  $t$  on the table of 2.145 at 0.05 level of significance for 14 degrees of freedom. Their perceptions were the same. Therefore, the null hypothesis was accepted.

Their perceptions were almost the same. Therefore, the decision was to accept the hypothesis. The computed value of  $t$  is not significant because it is less than the critical value of  $t$  on the table. The tested and agreed null hypothesis claims that there is no substantial gap in the attitudes of male and female freshmen at PSU-LC about the degree of adequacy of

instructional resources used in developing basic knowledge and skills in professional drawing.

The results supported Raposa's [5] contention that one of the factors influencing learning performance is the environment in which learning occurs. The classroom, textbooks, equipment, educational supplies, and other teaching resources are also included. If teaching is to achieve the necessary outcomes, the conditions for learning must be conducive and satisfactory both at school and at home. It is impossible to deny that the form and standard of instructional materials and facilities have a significant impact on the school's instructional performance. It is impossible to teach in an inadequate building with insufficient facilities and instructional materials. A school building or a classroom has no value whether it is constructed without consideration for its educational purposes and functions.

**Table 3**  
**Comparative Data on the Level of Adequacy of Instructional Materials Used in Developing the Basic Knowledge and Skilled in Technical Drawing and Instruction at the PSU-LC as Perceived by the Male and Female Freshmen Students**  
 N=100 Male, 100 Female, 200 Respondents

Instructional Materials	Male		Female		Average	
	WM	DE	WM	DE	WM	DE
1. Textbooks and reference books	2.57	A	2.41	A	2.49	A
2. Posters and flip charts	2.41	A	2.55	A	2.48	A
3. Charts	2.50	A	2.66	A	2.58	A
4. Chalkboard	2.71	A	2.75	A	2.73	A
5. Model plates	2.55	A	2.53	A	2.54	A
6. Drawing tools and materials	2.64	A	2.62	A	2.63	A
7. Drawing tables	2.46	A	2.56	A	2.51	A
8. Overhead projector	1.95	MA	1.93	MA	1.94	MA
Average Weighted Mean	2.47	A	2.50	A	2.49	A

$t_c = 0.248$

$t_{0.05, 14df} = 2.145$

$t_c < t_{0.05}$

Result: Not Significant

Decision: Accept  $H_0$

**Degree of Seriousness of the Problems Encountered in Acquiring the Basic Knowledge and Skills in Technical Drawing and Instruction among the Freshmen**

Table 4 compares the degree of severity of problems experienced in acquiring basic knowledge and skills in professional drawing and instruction among freshmen at PSU-LC, as viewed by male and female freshmen. The average weighted mean was 1.94 or moderately serious. When grouped, the problems encountered together with their weighted

means were: inadequate instructional materials, 2.11 or moderately serious; limited time appropriate for lecture, discussion, and activities, 2.17 or moderately serious; strategies are not appropriate for the development of course content, 1.59 or not serious; lack of trained instructors, 1.86 or moderately serious; and too expensive tools and materials, 1.96 or moderately serious.

Between the perceptions of the male and female freshmen in the PSU-LC, there was no significant difference in the degree of seriousness of

the difficulties faced by freshmen in learning basic knowledge and expertise in advanced drawing and instruction. This was shown of t of 0.361 which was less than the critical value of t on the table of 2.306 at 0.05 level of significance for 8 degrees of freedom.

Their perceptions were almost the same. Therefore, the decision was to accept the hypothesis. The computed value of t is not significant because it is less than the critical value of t on the table. The result was not significant. The null hypothesis was accepted. There is no substantial gap in expectations of the degree of severity of the problems experienced in acquiring the basic knowledge and skills in

technical drawing and instruction among freshmen at PSU-LC.

Arellano [6], in his investigation on the implementation of the Bachelor of Science in Industrial Education Program, revealed that the posed problems were serious. These problems were: inadequacy of tools, machines, and equipment, lack of laboratory supplies and materials for shop work, the inadequacy of books and reference materials of the latest edition, the deteriorating physical facilities, and the inadequacy of industrial aids and materials. There was no very serious problem as indicated.

**Table 4**  
**Comparative Data on the Degree of Seriousness of the Problems Encountered in Acquiring the Basic Knowledge and Skills in Technical Drawing and Instruction among the Freshmen at the PSU-LC as perceived by the Male and Female Students**  
 N=100 Male, 100 Female, 200 Respondents

Problems	Male		Female		Average	
	WM	DE	WM	DE	WM	DE
1. Inadequate instructional materials	2.07	MS	2.15	MS	2.11	MS
2. Limited time appropriate for lecture, discussion, and activities	2.17	MS	2.17	MS	2.17	MS
3. Strategies are not appropriate for the development of course content	1.66	NS	1.52	NS	1.59	NS
4. Lack of trained instructors	1.62	NS	2.10	MS	1.86	MS
5. Too expensive tools and materials	2.03	MS	1.89	MS	1.96	MS
Average Weighted Mean	1.91	MS	1.97	MS	1.94	MS

t<sub>computed</sub> = 0.361  
 t<sub>0.05,8df</sub> = 2.306  
 Result: Not Significant  
 Decision: Accept Ho

**Extent of Necessity of the Remedial Measures to Minimize the Problems Encountered in Acquiring the Basic Knowledge and Skills in Technical Drawing and Instruction among the Freshmen**

Table 5 presents comparative data on the degree to which remedial steps are needed to mitigate problems experienced in acquiring basic knowledge and skills in technical drawing and instruction among freshmen at PSU-LC, as viewed by male and female freshmen.

The extent was fairly necessary with an average weighted mean of 2.31. The remedial

measures together with their average weighted means when taken together were: instructional materials should be provided, 2.48 or necessary; add more time for the course, 2.35 or necessary; use appropriate and varied strategies, 2.18 or fairly necessary; more training and staff development for the instructors 2.26 or fairly necessary; and use the indigenous materials, 2.28 or fairly necessary. The table company the perceptions of the two groups of respondents and to test the null hypothesis the t-test was used. In the PSU-LC, There was no substantial gap in the attitudes of male and female freshmen on

the degree to which remedial steps were needed to alleviate the problems faced in learning the basic knowledge and skills in professional drawing and instruction of the freshmen. This was shown by the computed value of  $t$  of 0.499, which was less than the critical value of  $t$  on the table of 2.306 at 0.05 level of significance for 8 degrees of freedom.

Their perceptions were almost the same. Therefore, the decision was to accept the hypothesis. The computed value of  $t$  is not significant because it is less than the critical value of  $t$  on the table. The tested and agreed null hypothesis notes that there was no substantial gap in the attitudes of male and female freshmen at PSU-LC on the magnitude of the need for remedial steps to alleviate the problems faced in learning the basic knowledge and skills in professional drawing and instruction among the freshmen. Although the weighted means of

the two groups of perceptions varied, when they were subjected to a  $t$ -test they proved to be almost the same. The findings of the study should be considered by the authorities to join hands in doing something about these necessary measures to lessen the burden of the freshmen.

This must be taken into account in the study's results. According to Giesecke [7], precision, neatness, and pace are important in technical drawing. These goals are unlikely to be met with low-cost or subpar drawing tools. It is advisable and ultimately more cost effective for a student of a skilled drafter to buy the finest equipment that can be afforded. Good instruments can meet the most stringent criteria, and the enjoyment, time savings, and increased job efficiency that good instruments will deliver can more than justify the premium price.

**Table 5**  
**Comparative Data on the Extent of Necessity of the Remedial Measures to Minimize the Problems Encountered in Acquiring the Basic Knowledge and Skills in Technical Drawing and Instruction Among the Freshmen as Perceived by the Male and Female Students at the PSU-LC**

N=100 Male, 100 Female, 200 Respondents

Problems	Male		Female		Average	
	WM	DE	WM	DE	WM	DE
1. Instructional materials should be provided	2.56	N	2.40	N	2.48	N
2. Add more time for the course	2.40	N	2.30	FN	2.35	N
3. Use appropriate and varied strategies	2.11	FN	2.25	FN	2.18	FN
4. More training and staff development for the instructors	2.29	FN	2.23	FN	2.26	FN
5. Use the indigenous materials	2.27	FN	2.29	FN	2.28	FN
Average Weighted Mean	2.33	FN	2.29	FN	2.31	FN

$t_{computed} = 0.499$

$t_{0.05, 8df} = 2.306$

Result: Not Significant

Decision: Accept  $H_0$

### CONCLUSIONS

Based on the results, the following conclusions were reached: The course content in a technical drawing was achieved among freshmen at PSU-LC, and the techniques used in developing the basic knowledge and skills in technical drawing and instruction among freshmen were successful. The instructional materials used in developing the fundamental knowledge and skills in technical drawing were satisfactory, and the difficulties faced in acquiring the fundamental knowledge and skills in technical drawing and teaching among freshmen were moderately severe, finally, remedial steps to

reduce the difficulties encountered in learning basic knowledge and skills in technical drawing and teaching among freshmen were reasonably required.

### RECOMMENDATIONS

The following observations are made based on the preceding results and assumptions. The freshmen should constantly accomplish the course material in technical drawing, and the teachers should constantly optimize the use of successful techniques used in improving the basic knowledge and skills of technical drawing and teaching among the freshmen. The teachers and freshmen should ensure the adequacy of the resources used in developing the

fundamental knowledge and skills in professional drawing; the moderately severe problems found by the male and female freshmen need urgent intervention from the authorities and themselves, finally, the teachers and freshmen should take the requisite steps to alleviate the problems faced in learning the basic knowledge and skills in professional drawing and teaching.

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