The Comparison of Average Cost Per Student for Training and Influencing Variables in Library Schools

—Descriptive and Inferential Statistics—

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초 록

이 연구는 과학적 질문과 연구방법에 대한 특징과 기능을 제시하기 위한 것으로 도서관학과 학생 한 명의 교육비용과 이에 영향을 미치는 요소를 사회과학적 통계방법으로 분석하고 해석하였다.

분석을 위한 변수로서 학생 한명의 4년간 교육비용, 도서관 및 정보관련 업무분야에서의 취업률, 년간 봉급과 학교의 종류(사립, 공립)를 사용하였고, 추론적 통계방법으로는 t-test, 상관분석과 회귀분석을 적용하였다.

ABSTRACT

The purpose of this paper is to study to the nature and function of scientific inquiry and research methods, particularly as they apply to the influencing factors in library schools.

For the variables used, they are the average cost per student for training, the total percentage placement in library and library-related work, the average salary for year, and the type of schools. In interpreting data using, t-test analysis of correlation and regression are applied.

1. Introduction

Wherever the information needs to be organized and presented to patrons in an effective, efficient, and service-oriented fashion, the skills of professional librarians can be applied, whether or not they are in traditional library settings. However it will take considerable investment of time, energy, imagination, and money on the part of an individual before a satisfying position is created or obtained, in a conventional li-

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brary or another type of information service. Usually no one method or source of job hunting can be used alone.

Finding a position needs strategies for library school graduates. As usual, library career training institutions, that is library schools, can be devided into publics and privates by the type.

We can study about these schools in several aspects;

Is an average cost for training different according to the type of school?

Does the type of school have an effect on the everage salary and /or average percentage of library placement?

Does the high cost for training per student cause high percentages in library placement and /or high salary?

Methods for the study

For the hypothetical study, the thirty-third annual report on placement and salaries of graduates of ALA accredited library schools(1983) was used. Among the data thirty average salaries, average % in library placements were selected randomly from the report and the others were created. The 64% of mean average placement were known to be employed either in professional or non-professional positions in libraries or information-related work.

2. Descriptive analysis

The unit of analysis is each library school.

The variable 1(V1) : the everage cost per student.

The variable 2(V2) : the total % in library and library-related work

The variable 3(V3) : the average salary for a year

The variable 4(V4) : the type of school

Table #1, Figure #1A

The frequency of average cost per student was represented. It looks like normal distribution, but it is too tall and skinny(leptokurtic). The almost 80% of scores(23 out of 30) are roughly centralized within 1 standard deviation(5.55-9.25). This rate is 12% higher that of normal distribution in this area.

Simply by inspection, it has a peak in the mean area. It means most of the average costs for training are not much different within schools.

Figure #1B

The average cost frequency distribution for public schools is slightly negative skrewed, because the tail points toward the lower scores.(mean=6.4, mode and median=7) All the frequency distribution are within 2 standard deviation. 60% of the average cost for training in public schools is centralized beyond the mean.

Figure #1C

The average cost frequency distribution for private schools is slightly positive

skrewed that is opposite to Figure #1B. (mean=82, mode and median=8)

Figure #1D

Public schools and private schools were compared. The mean average cost per student in private schools is 1800$ higher than those in public schools. Central tendencies of average cost per student in private schools are all higher than those in public schools.

Table #2, Figure #2A

It expressed the total % in library placement. The curve shaped a bell-shaped with a peak in the middle. The curve is more centralized within 1 standard deviation than the typical bell-shaped.

Table #3, Figure #3A

When the public and private schools are compared in library placement, there's almost no difference between means of them(public: 64.1, private: 63.9). However, the 1 standard deviation total % placement of private was encompassed within 1 standard deviation total % placement of public schools.

Figure #3A

It has a bell-shaped like figure #2A but it is not symmetric.

Figure #3B

The typical bell-shaped is obtained. Compared with normal distribution, it has less centrallized within 1 standard deviation.

Figure #3C

It has a positive skrew(mode is higher than mean, mode=17, mean=18).

But the mode exist within 1 standard deviation.

The scattergrams in figure #4, 5, 6 represent the relationship among the variables. Figure #4 shows the relations between the average cost per student and placement in library. Figure #5 represensts the relations between the average cost per student and the average salary and the total % placement in library. Simply by inspection, figrure #4, 5 has a little positive relations, but figure #5 has none. Between #4 and #5, figure #5 has a little more scattered to the positive direction.

The next part will discuss about whether or not the relationships proposed are statistically significant.

DATA MATRIX

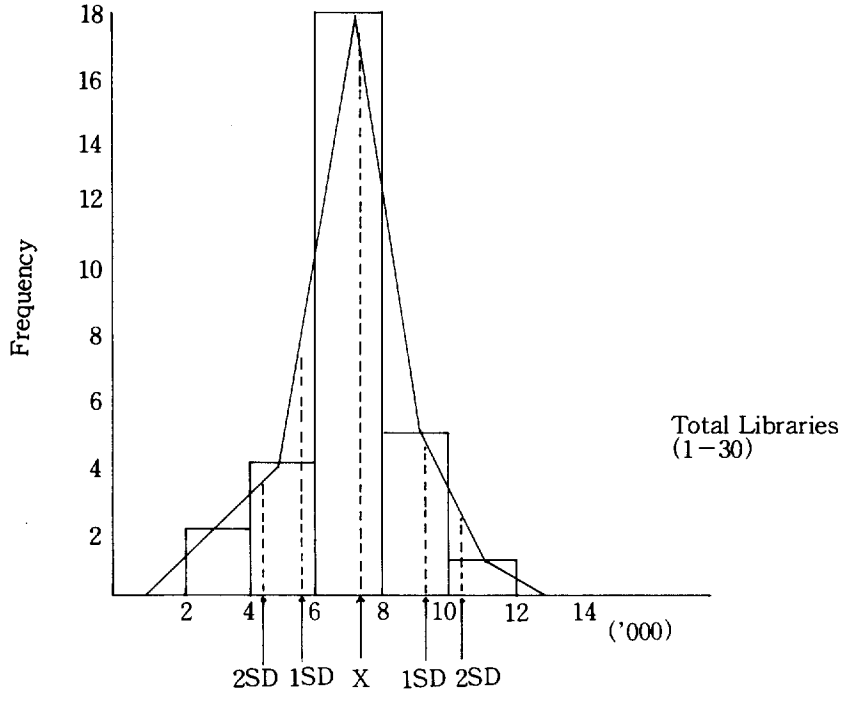
Unit of Analysis	V1	V2	V3	V4
Library School	Average Cost per Student ('000)	Total % in Library Placement	Average salary for a year ('000)	Type of Library
1	8	68	16	Public
2	6	63	17	
3	7	64	16	
4	7	74	17	
5	3	54	16	
6	5	58	15	
7	5	60	17	
8	6	57	16	
9	7	60	14	
10	8	65	15	
11	4	66	15	
12	7	68	16	
13	7	64	15	
14	8	69	18	
15	8	71	17	
16	7	72	17	private
17	8	56	18	
18	7	67	17	
19	8	62	19	
20	8	58	18	
21	8	63	17	
22	7	62	19	
23	9	59	20	
24	8	65	20	
25	7	64	19	
26	9	61	16	
27	8	70	17	
28	10	66	17	
29	10	64	18	
30	12	70	18	

Table #1

Average Cost per Student('000$)

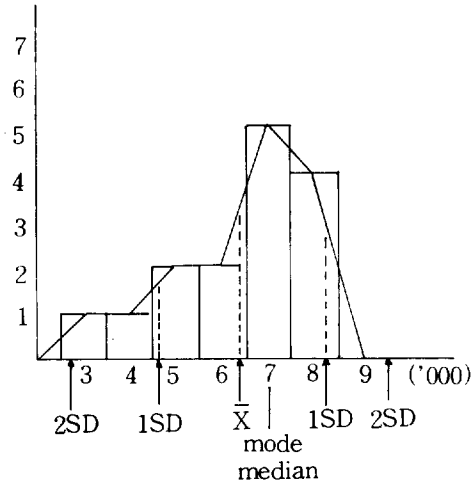
	Total Libraries (1−30)	Public Libraries (1−15)	Private Libraries (16−30)
Total	222	96	126
Mean	7.4	6.4	8.2
Mode	8	7	8
Median	7	7	8
Ceiling	12	8	12
Floor	3	3	7
Variance	3.4	3.26	2.84
Standard Deviation	1.85	1.8	1.68

✳ Frequency Distribution of Average Cost per Student ✳

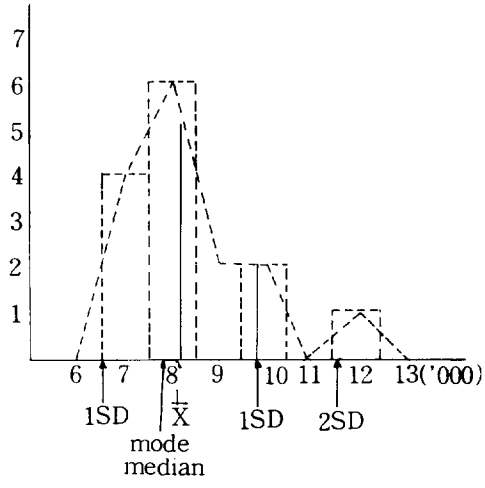


Average Cost per Student

Figure #1A



Public Schools Average Cost
Figure #1B



Private Schools Average Cost
Figure #1C

✳ Frequency Distribution of Average Cost per Student by Type ✳

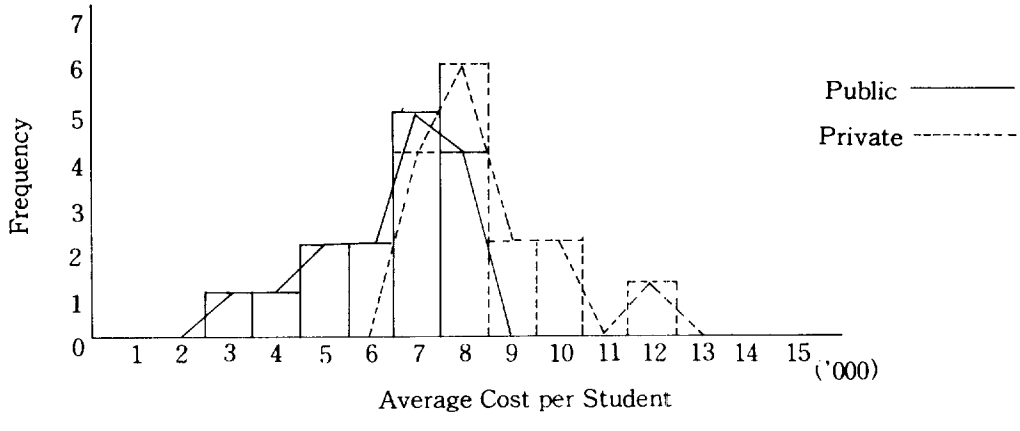


Figure #1D

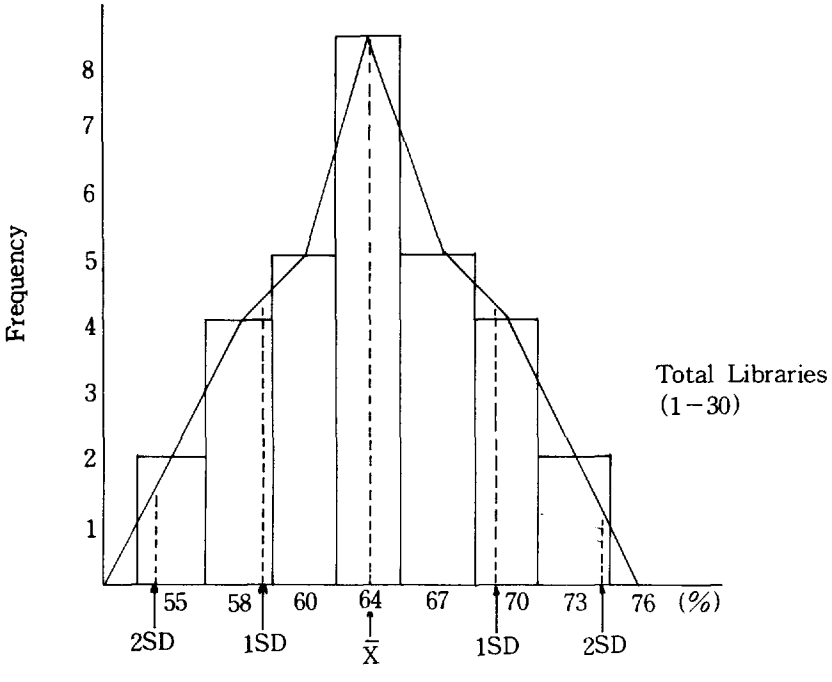
Table #2

Total Percentage in Library Placement (%)

	Total Libraries (1−30)	Public Libraries (1−15)	Private Libraries (16−30)
Total	1920	961	959
Mean	64	64.1	63.9
Mode	64	64	64
Median	64	64	64
Ceiling	74	74	72
Floor	54	54	52
Variance	24.3	28.48	19.53
Standard Deviation	4.9	5.3	4.4

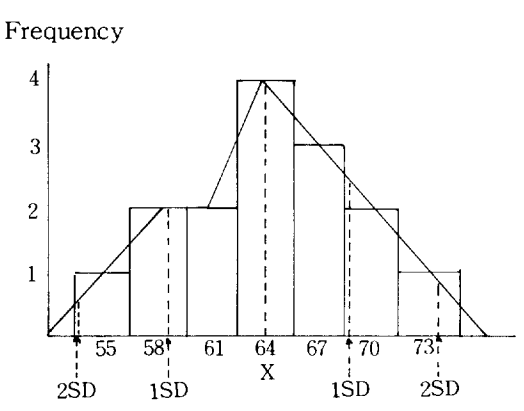
✳ Frequency Distribution of Total

✳ Frequency Distribution of Total % in Library Placement ✳

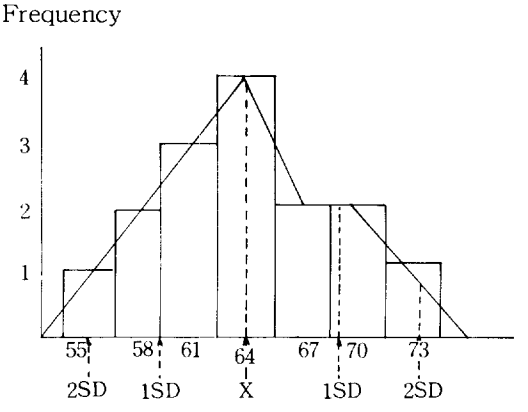


Total % in Library Placement
Figure #2A

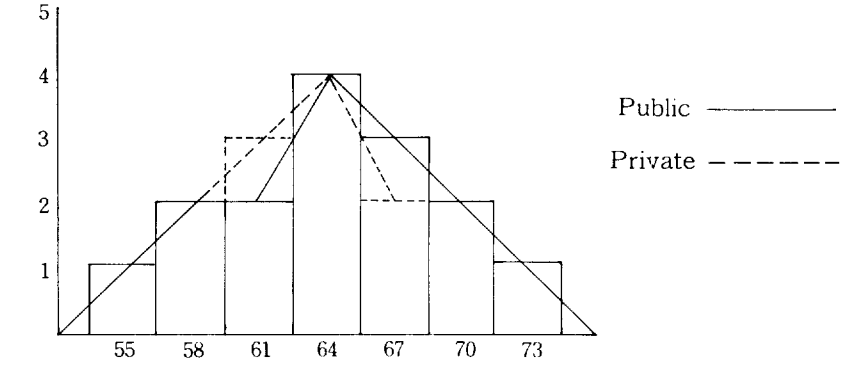
✳ Frequency Distribution of Total % in Library Placement by Type ✳



Public Schools' Total % in Placement
Figure #2B



Private Schools' Total % in Placement
Figure #2C



Total % in Library Placement
Figure #2D

Table #3

Average Salary for A Year('000$)

	Total Libraries (1−30)	Public Libraries (1−15)	Private Libraries (16−30)
Total	510	240	270
Mean	17	16	18
Mode	17	16	17
Median	17	16	18
Ceiling	20	18	20
Floor	14	14	17
Variance	2	2.2	1.3
Standard Deviation	1.4	1.5	1.15

✳ Frequency Distribution of Average Salary for a Year ✳

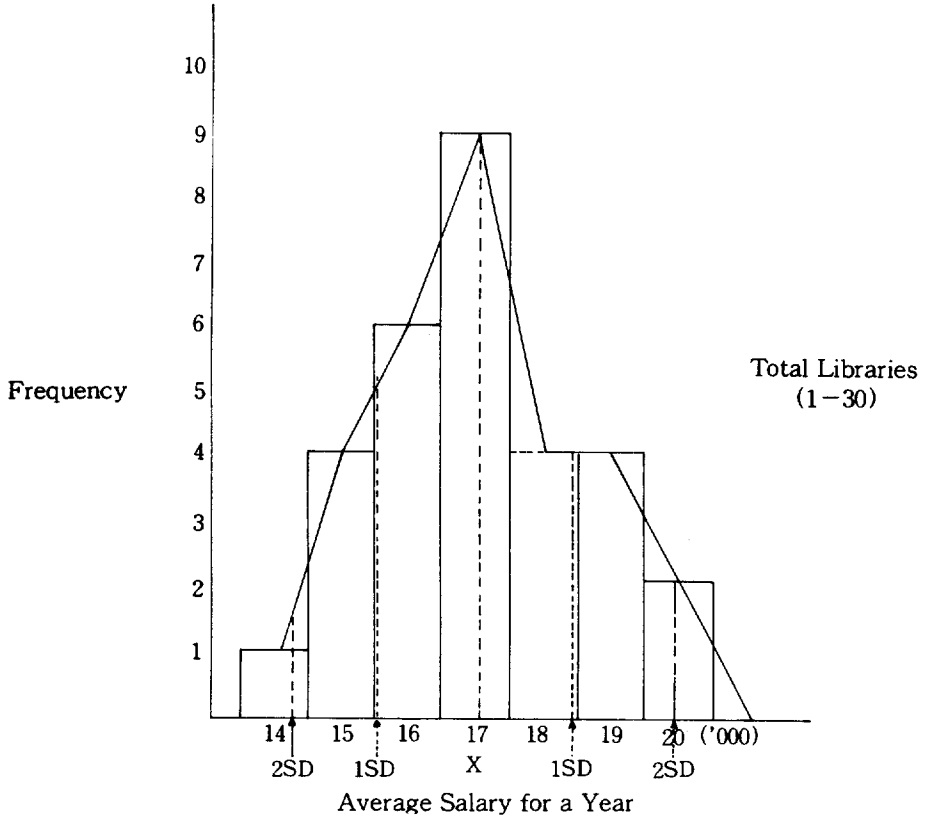
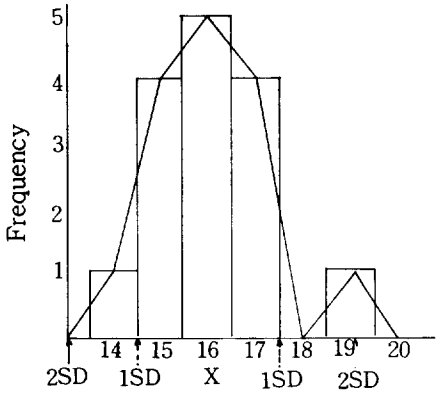
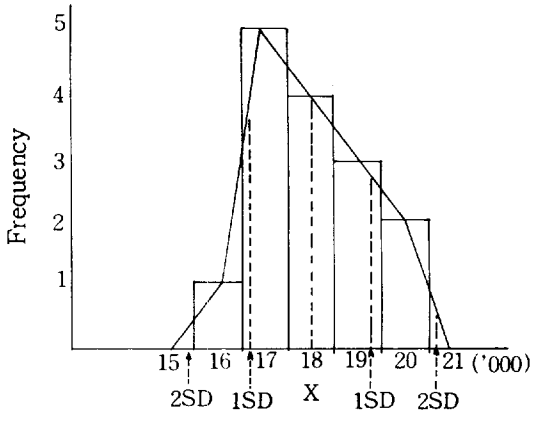


Figure #3A

✳ Frequency Distribution of Average Salary for a Year by Type ✳



Public Schools
Figure #3B



Pribate Schools
Figure #3C

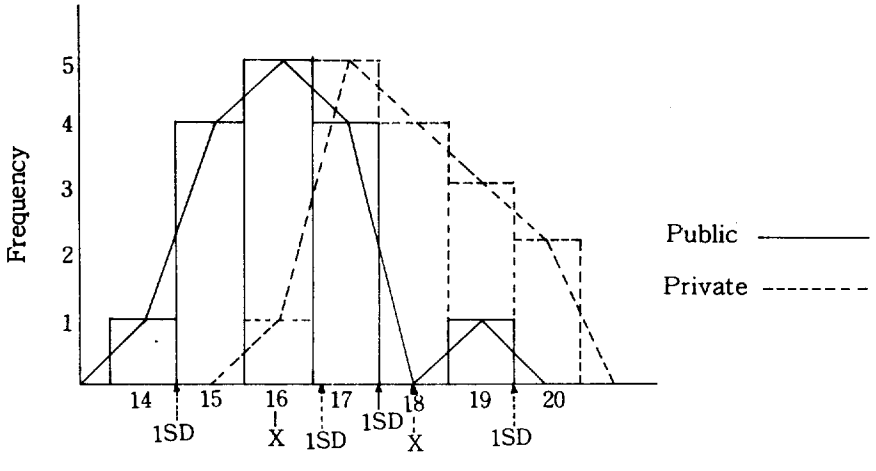


Figure #3D

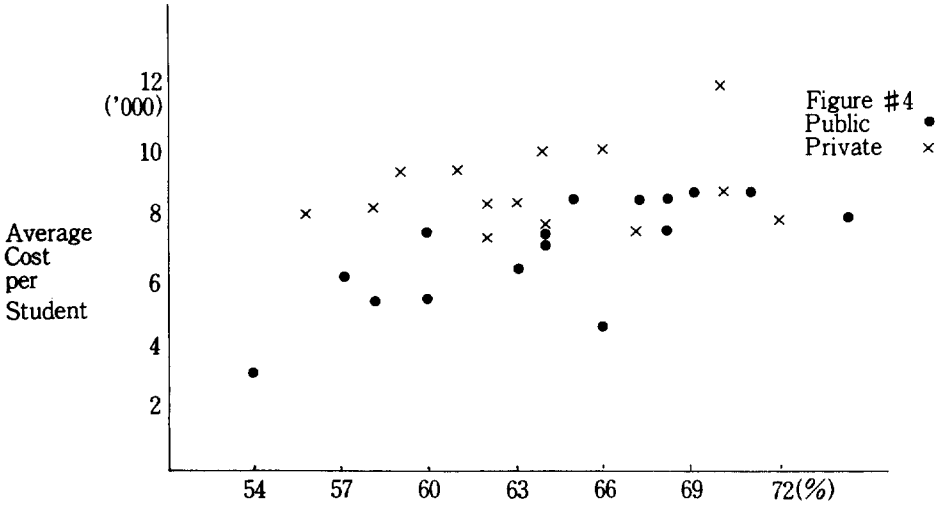


Figure #4

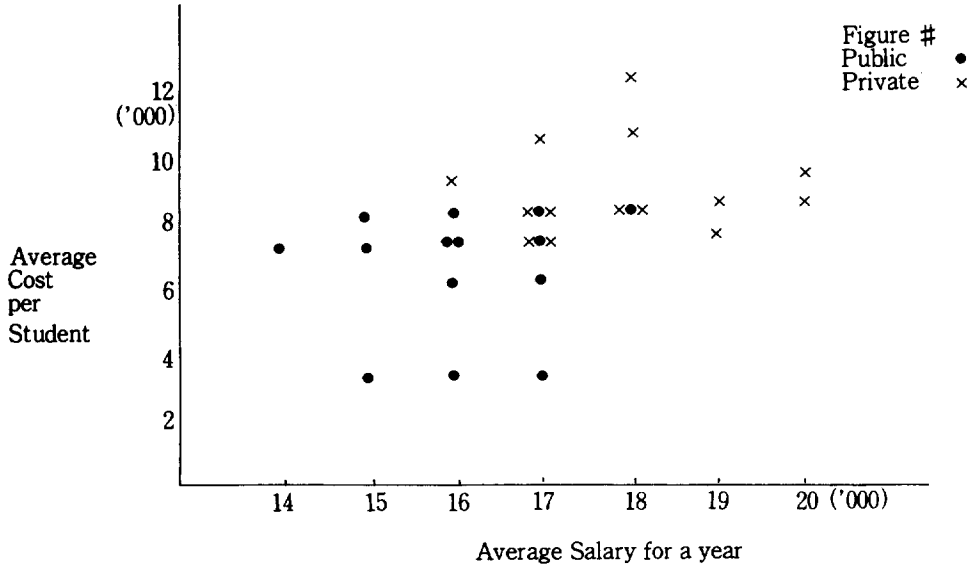


Figure #5

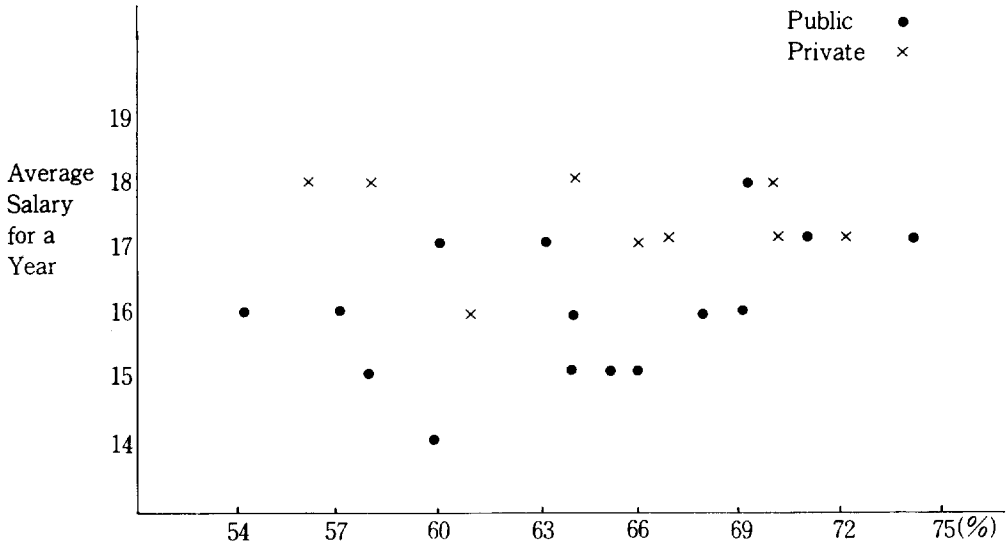


Figure #6

3. Inferential Analysis

The scattergrams in the figure #4, #5, #6, represent the relationship among the variables.

a. Figure #4 showed a relationship between the average cost per student and the total % placement in library and library-related work according to the type of schools (publics or privates)

b. Figure #5 represented positive relationship between the average cost per student and the average salary for a year according to the type.

c. Figure #6 depicted the relationship between the average salary for a year and total % placement by the type.

These figure can be used to generalize from sample data to the larger population. The data are composed of the 4 variables.

Dependent Variable(X) : the average cost per student

Independent Variable(Y) : total % in library placement

Independent Variable(Z) : the average salary for a year

Independent Variable(W) : the type of schools

They are 3 continuous variables and 1 nominal variable.

By simple inspection, we can easily find the difference between two pots. These are differences within the continuous variables by the type. Another finding is a liner re-

lationship (correlation) between two variables. (X−axis and Y−axis)

Methods of analysis

There are bascially two main types of tests can be applied to this data.

A. To find out the first difference between public schools and privates schools (continuous variable vs categorical variable), student t-test can be applied to each variable(X, Y, Z).

B. To figure out relationship between each continuous variable(X vs Y, X vs Z, Y vs Z), correlation and regression test can be applied.

My study begins to determine whether or not there is a statistically significant difference between the public schools and the privates in terms of the three variables(X, Y, Z). When we agree such a difference is a real difference which is over the level of sampling error, it is called research hypothesis(R.H.) Given a research hypothesis, this implies a null hypothesis(N.H.) of no difference. Using statistical reasoning, we can calculate the probability to be as low as, or lower than a level of probability set as a criterion for rejecting null hypothesis, the null hypothesis have to be rejected, and we accept the research hypothesis and conclude the sample means reflect the different population means.

Hypotheses

For three variables(X, Y, Z), there are three R.H. and corresponding N.H.

R.H. #1 : There is a statistically significant difference between publics and privates in terms of the average cost per student for training.

N.H. #1 : There is no statistically significant difference between publics and privates in terms of the average cost per student for training.

R.H. #2 : There is a statistically significant difference between publics and privates in terms of total % placement in library and library-related work.

N.H. #2 : There is no statistically significant difference between publics and privates in terms of total % placement in library and library-related work.

R.H. #3 : There is a statistically significant difference between publics and privates in terms of averagy salary for a year.

N.H. #3 : There is no statistically significant difference between publics and privates in terms of averagy salary for a year.

Significant level .05, two-tailed test are set. The number of degree of freedom is 28 (sample size- no. of variables).

T-test

Using statistical reasoning, t values for each hypothesis are calulated, they are 3.27 for N.H. 1, 0.11 for N.H.2, 4.87 for N.H.3. (Table 1,2,3) $t_{crit.5}$ df=28 ≥ ±2.04 is needed for rejecting the null hypothesis, thus only RH #2 failed to reject the null hypothesis. The others (RH #1, Rh #3) can reject NH in favor of RH. Thus differences exist between publics and privates in terms of variable X and variable Z(average cost per student and avérage salary for a year), while we can't find any difference between the types of library schools in terms of variable Y(total % placement in library). If my data have more than two groups in terms of a variable, F-test can be applied to test the differences among their respective sample means.

Correlation Analysis

We turn to different type of question to be answered statistically: To what degree do two or variables show interrelationships in a given population? One way to assess such relationships is accomplished by statistical procedures of correlation. Correlation, then, characterizes the existence of a relationship between variables.

But correlation itself only indexes the degree of relationship, and it yields a correlation coefficient which said the magnitude of relationship from −1(perfect negative) to +1(perfect positive).

To test this relationship

1. Yield coefficient of correlation(r) with the given sample means and standard deviation.
2. Assess statistical significant of relationship between variables.
3. Determine t value associate with significance level and sample size.
4. If the significance exist, set the hypothesis to analyze the correlation.

The research hypothesis is $r_{xy} \neq 0$

The null gypothesis is $r_{xy}=0$

This correlation test will be applied to the three pairs of relationships (X vs Y, X vs Z, Y vs Z). With the table 4, 5, the following coefficients of correlation and t values are yielded.

Relations	coefficient(r)	t value	t-test
Average cost(X) vs % Placement(Y)	0.47	2.81	>2
Average cost(X) vs Average salary(Z)	0.41	2.38	>2
% Placement(Y) vs Average salary(Z)	0.11	0.61	<2

$t_{crit,\ 05.}$ df=58>2.00

According to the results, we can find that the correlations between X and Y, and X and Z have statistical significance at the .05 level, t-test. Since the probability of obtaining r=.47 and r=.41 are less than the

level set for rejection ($p<.05$), the null hypothesis is rejected in favor of the R.H. So the conclusion goes that the two measures—average cost and % placement, average cost and average salary are indeed related, whereas the percentage associate with % placement and average salary($r=0.11$) which entered into a special formula fot was gone far beyond the .05 level($0.8<p<0.5$). This tells us that with a null hypothesis of $r=0$, there is no correlation, if it were, it would be due only to sampling error. Therefore the null hypothesis can't be rejected for relationship of Y and Z. r_{yz} is an insignificant finding.

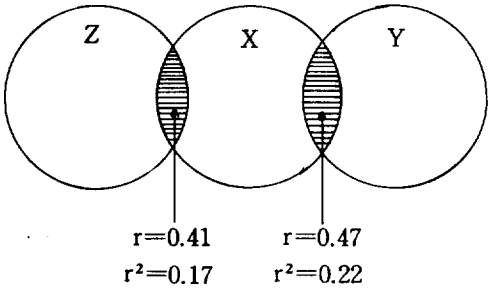
But r formula says nothing about a percentage of relationship.

There is not any standard way to say that $r=.47$ is almost 4 times more related than $r=.11$. In order to get some feel for what an r implies, it is often useful to consider r^2, which is called the coefficient of determination, is the proportion of variance that two measures have in common.

1. $r^2_{xy}=0.22$
2. $r^2_{xz}=0.17$

A Matrix of intercorrelation

	Y	Z
X	0.22	0.17
Y	...	...



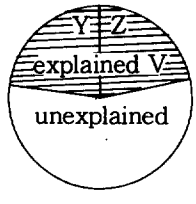


figure #7

Nearly 22% of the variability of the relationship of average cost per student and total % placement in library can be explained. Another 17% of the variability of the relationship of average cost and average salary can be explained, too. However the observed correlation between two variables is sometimes due to a cause-and-effect relationship; but a significant correlation is not of itself sufficient evidence to establish a causal relationship. Still we don't know the possibility whether or not one of its variable is affecting to the correlation between the other two variables($r_{xy\cdot z}$, $r_{yz\cdot x}$, $r_{xy\cdot y}$).

There is some possibility which seems likely that the correlation of cost and the % placement can be influenced by the average salary. In the same way the correlation of

average cost and average salary can be influenced placement. To figure out this assumptions, we can partial correlation.

With the given statistics, r_{xy}=.47, r_{xz}=.41, r_{yyz}=.11, we can calculate $r_{xy \cdot z}$=.47, $r_{xz \cdot y}$=.41, $r_{yz \cdot x}$=.11(table #6) As seen the calculation, r_{xy}=.47 is the same as r_{xy}=.41, $r_{yz \cdot x}$=.11 is the same as r_{yz}=.11, $r_{xz \cdot y}$=.41 is the same as r_{xz}=.41. So the conclusion is said, there is not any multiple correlation among the three variables. With this multiple correlation test the diagram (figure 7) proved once again.

Obviously, knowledge of the relations among variables can be more than an end in itself. Sometimes we can take advantages of a relationship and use it as a basis for prediction. That is, given a knowledge of the variable X and its relationship with the variable Y, we can take particular value of X and predict what corresponding value of Y would be.

This is the regression analysis and it can be dine by linear regression which is a method of finding 'the line of best fit'.

Regression Analysis

For example, when my data have a correlation between the average cost per student(X) and total % placement in library, a regression analysis would allow to predict how many % placement can be happened with the X variable. There are so many other analysis which can be applied on this data.

Until now several analysis have been obtained on my data, and we got some conclusions. Nearly 39% (r_{xy}^2=.22, r_{xz}^2=.17) of the factor the average cost per student (X) was influenced by the total % placement in library and the average salary for a year.

There are also other factors addressed in this paper which can influence average cost per student. Some of these factors are the ratio between faculty and student, the expenditures, types and levels of education hold in schools and so on.

Table #1 : Data for R.H. #1(t-test for average cost per student vs type)

Calculation of t

Ss	Grouped Data Public(A)	Private(B)	Deviations From Sample (A)	Means (B)	Deviations Squared (A)	(B)
1	8	7	1.6	-1.2	2.56	1.44
2	6	8	-0.4	-0.2	0.16	0.04
3	7	7	0.6	-1.2	0.36	1.44
4	7	8	-3.4	-0.2	11.56	0.04
5	3	8	-1.4	-0.2	1.96	0.04
6	5	8	-1.4	-0.2	0.16	0.04
7	5	7	-1.4	-1.2	1.96	1.44
8	6	9	-0.4	0.8	0.16	0.64
9	7	8	0.6	-0.2	0.36	0.04
10	8	7	1.6	-1.2	2.56	1.44
11	4	9	-2.4	0.8	5.76	0.64
12	7	8	0.6	-0.2	0.36	0.04
13	7	10	0.6	1.8	0.36	3.24
14	8	10	1.6	1.8	2.56	3.24
15	8	12	1.6	3.8	2.56	14.44
M	6.4	8.2		$\Sigma d^2=33.6$		28.20
n	15	15				

The test of the null hypothesis is outlined below.

1. N.H : $\mu_A=\mu_B$ R.H. : $\mu_A\neq\mu_B$
2. t-test for independent samples, $n_a=n_b=15$
3. .05 level, two-tailed test, df=28
   R=t≤-2.04 or t≥2.04

$$t=\frac{M\,I-M\,II}{\sqrt{\left(\frac{\Sigma d_1+\Sigma d_2}{n_1+n_2-2}\right)\left(\frac{n_1+n_2}{n_1\cdot n_2}\right)}}=\frac{8.2-6.4}{\sqrt{\left(\frac{33.6+28.2}{15+15-2}\right)\left(\frac{15\times 2}{15\times 15}\right)}}=3.2 \qquad t=3.2>2.04$$

4. There is statistically significant difference between publics and privat in terms of average cost per student for training.

Table #2 : Data for R.H. #2(t-test for total % placement vs type)

Calculation of t

Ss	Grouped Data Public(A)	Private(B)	Deviations From Sample (A)	Means (B)	Deviations Squared (A)	(B)
1	68	72	3.9	8.1	15.2	65.61
2	63	56	-1.1	-7.9	1.21	62.41
3	64	67	-0.1	3.1	0.01	9.61
4	74	62	9.9	-1.9	90.01	3.61
5	54	58	-10.1	-5.9	102.01	34.81
6	58	63	-6.1	-0.9	37.21	0.81
7	60	62	-4.1	-1.9	16.81	3.61
8	57	59	-7.1	-4.9	50.41	24.01
9	60	65	-4.1	1.1	16.81	1.21
10	65	64	0.9	0.1	0.81	0.01
11	66	61	1.9	-2.9	3.61	8.41
12	68	70	3.9	6.1	15.21	37.21
13	64	66	0	2.1	0	4.41
14	69	64	4.9	0.1	24.01	0.01
15	71	70	6.9	6.1	47.61	37.21
M	64.1	63.9		$\Sigma d^2=420.93$		292.95
n	15	15				

The test of the null hypothesis is outlined below.

1. t_{crit}, .05, $df=28 \geq \pm 2.04$

2.
$$t=\frac{MI-MII}{\sqrt{\left(\frac{Id_1+\Sigma d_2}{n_1+n_2-2}\right)\left(\frac{n_1+n_2}{n_1 \cdot n_2}\right)}}=\frac{64.1-63.9}{\sqrt{\left(\frac{420.93+292.95}{28}\right)\left(\frac{15\times 2}{15\times 15}\right)}}=0.11<0.24$$

3. There is nostatistically significant difference between publics and privates in terms of total % placement in library.

Table #3 : Data for R.H. #3(t-test for average salary for a year vs type)

Calculation of t

Ss	Grouped Data Public(A)	Private(B)	Deviations From Sample (A)	Means (B)	Deviations Squared (A)	(B)
1	16	17	0	-1	0	1
2	17	18	1	0	1	0
3	16	17	0	-1	0	1
4	17	19	1	1	1	1
5	16	18	0	0	0	0
6	15	17	-1	-1	1	1
7	17	19	1	1	1	1
8	16	20	0	2	0	4
9	14	20	-2	2	4	4
10	15	19	-1	1	1	1
11	15	16	-1	-2	1	4
12	16	17	0	-1	0	1
13	15	17	-1	-1	1	1
14	18	18	2	0	4	0
15	15	18	1	0	1	0
M	16	18		$\Sigma d^2=16$		20
n	15	15				

The test of the null hypothesis is outlined below.

1. $t_{crit,\ .05,\ df=28} \geq \pm 2.04$
2. $$t=\frac{18-16}{\sqrt{\left(\frac{16+20}{28}\right)\left(\frac{15\times 2}{15\times 15}\right)}}=\frac{2}{\sqrt{0.17}} \fallingdotseq 4.87>2.04$$
3. There is statistically significant difference between publics and privates in terms of average salary.

Table #4 : Data Matrix for correlation between average(X) cost and % placement(Y)

Calculation of r

Ss	Raw Data X	Raw Data Y	Deviations from Means X	Deviations from Means Y	XY	X^2	Y^2
1	8	68	0.6	4	40.8	0.36	16
2	6	63	-1.4	-1	1.4	1.96	1
3	7	64	-0.4	0	0	0.16	0
4	7	74	-0.4	10	-10.4	0.16	100
5	3	54	-4.4	-10	44	19.36	100
6	5	58	-2.4	-6	14.4	5.76	36
7	5	60	-2.4	-4	9.6	5.76	16
8	6	57	-1.4	-7	9.8	1.96	49
9	7	60	-0.4	-4	1.6	0.16	16
10	8	65	0.6	1	0.6	0.36	1
11	4	66	-3.4	2	-6.8	11.56	4
12	7	68	-0.4	4	-1.6	0.16	16
13	7	64	-0.4	0	0	0.16	0
14	8	69	0.6	5	3.0	0.36	25
15	8	71	0.6	7	4.2	0.36	49
16	7	72	-0.4	8	-3.2	0.16	64
17	8	56	0.6	-8	-4.8	0.36	64
18	7	67	-0.4	3	-1.2	0.16	9
19	8	62	0.6	-2	-1.2	0.36	4
20	8	58	0.6	-6	-3.6	0.36	36
21	8	63	0.6	-1	-0.6	0.36	1
22	7	62	-0.4	-2	0.8	0.16	4
23	9	59	1.6	-5	-8.0	2.56	25
24	8	65	0.6	1	0.6	0.36	1
25	7	64	-0.4	0	0	0.16	0
26	9	61	1.6	-3	-4.8	2.56	9
27	8	70	0.6	6	3.6	0.36	36
28	10	66	2.6	2	5.2	6.76	4
29	10	64	2.6	0	0	6.76	0
30	12	70	4.6	6	27.3	21.16	36

$\bar{X}=7.4$ $\bar{Y}=64$ $\Sigma dx \cdot \Sigma dy=120.7$ $\Sigma Xx=91.2$ $\Sigma Yz=722$

$$\sqrt{xy}=\frac{\Sigma_{xy}}{\sqrt{\Sigma_{x^2}\cdot\Sigma_{y^2}}}=\frac{120.7}{\sqrt{91.2\times722}}=0.47$$

$$t=\frac{r\sqrt{n-2}}{\sqrt{1-r^2}}=\frac{0.47\sqrt{30-2}}{\sqrt{1-0.47^2}}=\frac{2.48}{0.88}=2.81$$

Table #5 : Data Matrix for correlation between X anZ, Y and Z Z
Calculation of r

Ss	Raw Data Z	Deviations from Means Z	xz	yz	z^2
1	16	-1	-0.6	-4	1
2	17	0	0	0	0
3	16	-1	0.4	0	1
4	17	0	0	0	0
5	16	-1	4.4	10	1
6	15	-2	4.8	12	4
7	17	0	0.	0	0
8	16	-1	1.4	7	1
9	14	-3	1.2	12	9
10	15	-2	-1.2	-2	4
11	15	-2	6.8	-4	4
12	16	-1	0.4	-4	1
13	15	-2	0.8	0	4
14	18	1	0.6	5	1
15	17	0	0	0	0
16	17	0	0	0	0
17	18	1	0.6	-8	1
18	17	0	0.	0	0
19	19	2	1.2	-4	4
20	18	1	0.6	-6	1
21	17	0	0	0	0
22	19	2	-0.8	-4	4
23	20	3	4.8	-15	9
24	20	3	1.8	3	9
25	19	2	-0.8	0	4
26	16	-1	-1.6	3	1
27	17	0	0	0	0
28	17	0	0	0	0
29	18	1	2.6	0	1
30	18	1	4.6	6	1
	$z=17$		32.0	24	$\Sigma Z^2=66$

$$\sqrt{}_{xy}=\frac{\Sigma_{xz}}{\sqrt{\Sigma_{x2}\cdot\Sigma_{z^2}}}=\frac{32}{\sqrt{91.2\times66}}=\frac{32}{77.58}=0.41$$

$$t=\frac{r\sqrt{n-2}}{\sqrt{1-n^2}}=\frac{0.41\sqrt{28}}{\sqrt{1-0.41^2}}=\frac{2.16}{0.91}=2.28$$

$$\sqrt{}_{yz}=\frac{\Sigma_{yz}}{\sqrt{\Sigma_{y^2}\cdot\Sigma_{z^2}}}=\frac{24}{\sqrt{722.16}}=\frac{24}{218}=0.11$$

$$t=\frac{(0.11)\sqrt{28}}{\sqrt{\Sigma_{y^2}\cdot\Sigma_{z^2}}}=\frac{24}{\sqrt{722.16}}=\frac{24}{218}=0.11$$

$$t=\frac{(0.11)\sqrt{28}}{\sqrt{1-0.01}}=\frac{0.58}{0.94}=0.61$$

Table #6

Given : $\sqrt{xy}=0.47$

$\sqrt{xz}=0.41$

$\sqrt{yz}=0.11$

$$\sqrt{xz\cdot y}=\frac{\sqrt{xz}-\sqrt{xy}\cdot\sqrt{yz}}{\sqrt{1-r^2_{xy}}\ \sqrt{1-r^2_{zy}}}=\frac{0.41-0.47\times0.11}{\sqrt{1-0.47^2}\ \sqrt{1-0.11^2}}=\frac{0.36}{0.87}=0.41$$

$$\sqrt{xy\cdot z}=\frac{\sqrt{xy}-\sqrt{yz}\cdot\sqrt{xz}}{\sqrt{1-r^2_{yz}}\ \sqrt{1-r^2_{yz}}}=\frac{0.47-0.41\times0.11}{\sqrt{1-0.41^2}\ \sqrt{1-0.11^2}}=\frac{0.43}{0.90}=0.47$$

$$\sqrt{yz\cdot x}=\frac{\sqrt{yz}-\sqrt{xy}\cdot\sqrt{xz}}{\sqrt{1-r^2_{xy}}\ \sqrt{1-r^2_{xz}}}=\frac{0.11-0.41\times0.47}{\sqrt{1-0.47^2}\ \sqrt{1-0.41^2}}=\frac{0.08}{0.71}=-0.11$$

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