

# Determinants of Chemistry Performance of Teacher Education Students of State Colleges and Universities in Cagayan Valley

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**Abstract**—Chemistry is an interesting subject that its usefulness is interrelated with all the varied sciences now and emerging. Excellent performance in the subject is the result of the collaborative processes of the student's background, teaching-learning strategies in lecture and laboratory, management and facilities. Thus, the conduct of the study to find out the determinants of Chemistry performance of Teacher Education students. The Descriptive Correlation Method is used with questionnaire checklist as instrument to gather relevant data from the 297 respondents. Findings showed that Chem was interesting and enjoyable but much feared. Excellent teacher's personality and motivation, lecture/laboratory room management, and learning environment and often use of the traditional methods of teaching though utilizing limited laboratory equipment and supplies/consumables affect the performance. Furthermore, student's ethnicity and teacher's deepen concern and encouragement shows a significant effect on the performance.

**Keywords**—Chemistry Performance, Fears, Interest, Laboratory Management, Students

## I. INTRODUCTION

SCIENCE as man knows today, is a systematized body of knowledge based on observations and experimentations.

Every classification of science uses scientific method which includes observation and gathering of data in each step. Scientific theories and laws are used as bases to express the mathematical data gathered for future and useful results for other fields. These results are vital to almost various fields of interest like industrial, medical and educational improvements.

Chemistry teaching and learning in the tertiary level is not spared from the situations affecting science education. Performances in Chemistry and other science related fields are significantly related with other factors.

Chemistry is a laboratory science; no instruction in Chemistry would be complete without some laboratory component [1]. It goes with the experimentalism educational doctrine of relying on experimentation using empirical data that are valid and reliable to establish the truth [2].

Chemistry instruction greatly affects students, personally, academically and professionally. Even for the student teachers they have fear and interest to the subject. The teacher's personality, methods of teaching, lecture and laboratory room managements are factors to be addressed for their betterment. Content is delivered using a variety of media and resources. From a textbook driven coverage of content, schools are encouraged to use Information and Communication Technology (ICT) and community resources to widen access to knowledge and to enrich learning. The teaching-learning process is interactive where learners, the teachers, instructional materials and information technology interact with one another. Learning is assessed using a variety of measures. The purpose is to gather information about the learners' progress in holistic terms. The restructured curriculum involves innovative, interdisciplinary and integrative modes of institutional delivery [3].

Results of performance, that is, student's participation both from the lecture and in the laboratory, teacher's personality, motivation and management strategies of the learning environment are interconnected for students to continue the acquisition of basic scientific knowledge and skill for their higher development and applications of concepts in real life. Thus, the study was conceptualized to find out the relationship of the interconnecting variables with the level of performance of the respondents in Chemistry 1a.

### A. Objectives:

The study aimed to find out the determinants of Chemistry performance, specifically with the following objectives:

1. determine the profile of the respondents;
2. determine the level of students' interests and fears, teacher factors, condition of the learning environment, lecture /laboratory room condition; and

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3. determine the significant relationship between the students, teachers, learning environment factors and the level of performance in Chemistry 1a.

### B. Significance of the Study

Findings of the study provide insight to students to confront their fears, appreciate the subject clearly in classroom lectures and performance of lab activities.

Science Instructors would determine alternatives methods and strategies in strengthening abilities and skills by making adjustments with manuals to adapt to the capabilities and capacities of their students and make alternatives to make available and adequate materials to cater to the number of students in their class/es.

School Administrators, to extend their assistance by acquiring state of the art facilities and providing enough lab materials and supporting faculty development in research trainings.

## II. METHODOLOGY

At the positive aim of the study to enhance the chemistry performance of students, the Descriptive Correlation Method was used. The relationship between the student factors, teacher factors, learning environment and the level of performance in Chem 1a of the sophomore Teacher Education students was the main concern through the use of questionnaire. The subjects of the study were two hundred ninety seven (297) sophomore Teacher Education students who took up Chemistry 1a or Integrated Physical Science on the second semester of the SY 2010-2011 from the selected state college and universities in the region, through Multi-Stage and Cluster sampling. The Slovin formula was used in determining the samples from each population.

Frequency and Percentage was used to describe the profile of the respondents. Mean was used to determine the level of interests and fears of the students, the personality and motivation, lecture and laboratory environment management of the teacher, lecture/laboratory room conditions and the availability of laboratory equipment, supplies/ consumables and state of the art facilities. Multiple Regressions was used to determine the significant predictors/variables between the students' factor, teacher factors and learning environment and the level of performance in Chemistry.

TABLE I  
SCALE USED IN DETERMINING THE PERFORMANCE LEVEL IN CHEMISTRY OF THE RESPONDENTS

1.00-1.50	Excellent
1.51 – 2.00	Very Satisfactory
2.01- 2.50	Satisfactory
2. 51-2.99	Fair
3.00-3.99	Passing
4.00-5.00	Poor

## III. RESULTS AND DISCUSSION

### A. Profile of the Respondents

TABLE II.  
PROFILE OF THE RESPONDENTS

Profile	Frequency	Percent (%)
<i>Course</i>		
BSEd	145	48.8
BEEd	152	51.2
<i>Age</i>		
16-17 years old	90	30.3
18-19 years old	165	55.6
20-21 years old	32	10.8
22 and above	10	3.4
<i>Type of High School Graduated From</i>		
Public	271	91.2
Private	26	8.8
<i>Curriculum in the high school</i>		
Regular	269	90.6
Science	28	9.4
<i>Location of the school graduated From</i>		
Poblacion/central	223	75.1
Highland/mountainous	74	24.9
<i>Ethnicity</i>		
Ilocano	153	51.8
Ibaloi	20	6.7
Ifuago	35	11.8
Itawis	6	2.0
Ilongot/Bugkalot	3	1.0
Kalanguya	17	5.7
Gaddang	1	0.3
Kalinga	1	0.3
Kankanaey	2	0.7
Others(Ibanag, Waray, Bisaya)	59	19.9
<i>Highest Educational Attainment of Mother</i>		
College Graduate	60	20.2
College Level	44	14.8
High School Graduate	60	20.2
High School Level	48	16.2
Elementary Graduate	28	9.4
Elementary Level	55	18.5
Not Attended School	2	0.7
<i>Highest Educational Attainment of Father</i>		
College Graduate	42	14.1
College Level	60	20.2
High School Graduate	50	16.8
High School Level	60	20.2
Elementary Graduate	37	12.5
Elementary Level	47	15.8
Not Attended School	1	0.3
<i>Monthly Income of Parents</i>		
14,000 and above	24	8.1
11,000-13,999	30	10.1
8,000-10,999	63	21.2
5,000-7,999	178	59.9
below-4,999	2	0.7
<i>Total</i>	297	100.0

When the 297 respondents were grouped according to the given profile, 51.2 % are in Bachelor in Elementary Education, 55.6 % are within the age range of 18-19 years, 91.2 % graduated from the public schools, 90.6 % from regular curriculum from within the poblacion or central area and 51.8 % are Ilocanos, 20.2 % of the mothers of the respondents were high school graduates, their fathers were College and High School levels and most of the respondents' parents' income have a range of Php5,000 to Php 7,999.

*B. Chemistry Performance*

TABLE III  
FREQUENCY, PERCENTAGE AND PERFORMANCE LEVEL OF THE RESPONDENTS IN TERMS OF THEIR GRADE IN CHEMISTRY 1A OR INTEGRATED PHYSICAL SCIENCE

Grade Interval	Qualitative Description	Frequency	Percent (%)	Mean
1.0-1.50	Excellent	46	15.5	2.58
1.51-2.0	Very Satisfactory	119	40.1	
2.01-2.50	Satisfactory	82	27.6	
2.51-2.99	Fair	16	5.4	
3.0-3.99	Passing	32	10.8	
4.0-5.0	Poor	2	0.70	
Total		297	100.0	Fair

The results revealed that the most of the respondents were within the *Fair* range of performance in Chemistry.

*C. Relationship of the Determinants and the Level of Performance in Chem 1a*

The data shows a computed F value of 16.819 with <0.01 level of significance. The result showed a significant relationship between the above-identified factors and the level of performance in Chemistry. The multiple regression correlation value of R = 0.662 suggests a substantial relationship between the independent variables and the level of performance in Chemistry. The adjusted R Square with a value of 0.438 suggests that 43.8% of the variability of the dependent variable is attributed to the identified significant factors in the study.

The first identified factor as to profile is ethnicity. Ethnicity, with a beta coefficient of 0.362 and a t-value of 6.713, contributes positively and significantly to the level of performance at p = <0.01. The result implies that level of performance is higher with the Ibanags, Warays, Bisayas and Kankanaeys. The result indicates that when they perform higher they value their studies; the higher is their level of performance.

The second factor as to attitude towards chemistry that registered significant influence to the dependent variable is spilling parts of the materials, with a beta coefficient of -0.090 and a t-value of -1.868, contributes negatively and significantly the level of performance in Chemistry at p = <0.01. The result infers that when they fear much of spilling

the materials, there will be lower performance level in Chemistry. If they would not fear then they will be able to calmly do their work in the lab then they will have a high performance.

TABLE IV  
RELATIONSHIP OF THE DETERMINANTS AND THE LEVEL OF PERFORMANCE IN CHEM 1A

Determinants	Beta	t-value	Sig
<i>Profile</i>			
Ethnicity	X <sub>1</sub> 0.362	6.713	<0.01
<i>Students fears</i>			
Spilling Parts of the Material	X <sub>2</sub> -0.090	-1.868	0.063
<i>As to Lecture/Laboratory Room Management</i>			
Considers the disabilities of students when considering seating arrangements.	X <sub>3</sub> -0.163	-3.309	0.001
<i>As to Lecture Room Condition</i>			
The lecture room is clean before conducting any activity and away from garbages and waste areas to ensure efficient and effective learning.	X <sub>4</sub> -0.329	-4.997	<0.01
The size of the lecture room is enough for the number of students.	X <sub>5</sub> 0.129	2.490	0.013
<i>As to Laboratory Room Condition</i>			
The teacher checks the attendance before, during and after the activity using a classroom/laboratory record.	X <sub>6</sub> 0.335	5.800	<0.01
<i>As to Availability of Laboratory Equipment , Supplies/Consumables and State of the Art Facilities</i>			
Basins	X <sub>7</sub> -0.371	-5.157	<0.01
Erlenmeyer flask	X <sub>8</sub> 0.163	2.383	0.018
Iron Ring	X <sub>9</sub> 0.327	4.777	<0.01
Tripod	X <sub>10</sub> -0.200	-2.749	0.006
Wire gauze	X <sub>11</sub> -0.173	-2.336	0.020
<i>As to Consumables</i>			
Filter paper	X <sub>12</sub> 0.291	4.744	<0.01
<i>As to state of the art Facilities</i>			
Others ( Chemistry and Physics State software)	X <sub>13</sub> 0.182	3.599	<0.01

Dependent Variable	=	Level of Performance in Chem 1a
R – Value	=	0.662
R Square	=	0.438
F – Value	=	16.819
Significance	=	<0.01
Constant	=	1.871

The next factors as to laboratory/lecture room management that were positioned with a beta coefficient of -0.163 and a t-value of -3.309 which contributes negatively and significantly the level of performance at  $p = 0.011$  considers the disabilities of students when considering seating arrangement and the lecture room is clean before conducting any activity and away from any garbage and waste areas to ensure efficient and effective learning with a beta value of -0.329, t-value of -4.997 at  $p < 0.01$ . The result of the statistical test infers that though the management of the teacher is very satisfactory it contribute less to the level of performance in Chemistry in contrast with the lecture/lab conditions which are very satisfactory contribute more to the level of performance in Chemistry of the students.

In terms of the availability of materials, limited number of basins, tripod and wire gauze contribute to the higher performance level of the students but a positive correlation with the limited number of Erlenmeyer flask and iron ring. From which it shows that though the materials are limited it did not impair to make their performance level in Chemistry higher. As to supplies and state of the art facilities with beta value = 0.291, t-value = 4.744 at  $p < 0.01$  and beta value = 0.182, t-value = 3.559 at  $p < 0.01$  it shows a positive significance, though there is a limited number of filter paper still the students performed higher in Chemistry. This shows that limited number of materials should not impair the attainment of the goals of the activity and this will be the avenue for maximum use of improvisation of materials in Science classes particularly in Chemistry.

The study obtained the multiple regression equation with the formula:  $Y_{Soc.Vul.} = f(x_n)$ . This is reflected in the following multiple regression equation:

$$Y = 1.871 + 0.362 x_1 - 0.090 x_2 - 0.163 x_3 - 0.329 x_4 + 0.129 x_5 + 0.335 x_6 - 0.371 x_7 + 0.163 x_8 + 0.327 x_9 - 0.200 x_{10} - 0.173 x_{11} + 0.291 x_{12} + 0.182 x_{13}$$

where x and y are detailed in the study.

The above situation collaborates with Holstein [4] when he said that teachers need knowledge, skilflexion.ls and resources that enable them to teach effectively in practical learning environment. They need to be able to enable students to interact intellectually, physically, involving hands-on investigation and minds on reflection.

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