

Association of Mathematical Ability And Reading Comprehension to the Chemistry Performance of Bachelor of Science Criminology Students of Naval State University, Naval, Biliran Province

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Abstract: The study was conducted to determine the association of mathematical ability and reading comprehension skills to the chemistry performance of BS Criminology students of Naval Institute of Technology. Utilizing the descriptive-correlation method, 120 respondents in Chemistry class were involved as subjects of this study. Male students dominated the student population of the BS Criminology of Naval Institute of Technology. Most of them graduated from public high school. More than one-fourth of their fathers were farmers and about three-fourth of their mothers were housekeepers. Their family's mean income posted at Php 6,355.83. The time spent by students in studying chemistry per day was less than an hour. Their average grades in Mathematics and English fell under the grade level of 2.1 to 2.5. As regard the respondents' mathematical ability, reading comprehension skills, and chemistry performance, the results of the test showed that they fell on "low" description. In the test relationship, there is a significant relationship between the mathematical ability and reading comprehension skills of the respondents to their academic performance in chemistry. It is commended that teachers should design stimulating materials, enhanced activities, and employ remedial measures to address issues and problems on poor academic performance of the subject. There is also a need for teachers to be updated and upgraded with the current trends in teaching chemistry.

Key Terms: Chemistry Performance; Mathematical Ability; Reading Comprehension:

I. INTRODUCTION

Education is society's main avenue for the development of basic literacy, numeracy, thinking and work skills that will enable every individual to become productive, civic minded and well-developed. Alegria (2007) perceived that enhancing the intellectual growth and development of every individual necessitates trainings and exercises to develop his potentialities, talents and skills in order to attain exemplary quality of life. Promoting the growth and development of the students requires reading comprehension skills, mathematical ability and scientific knowledge.

Salazar (1989) stated that reading is the primary avenue to all knowledge. It offers access to information, ideas, aspirations and happenings of both past and present. He hails reading as a means to effective learning. As a complex process, Miller and Segmour (1950) stressed that reading involves all the higher mental processes namely; recall, reasoning, imagining, organizing, applying and problem solving. Hence, success in reading defines one's future success.

Aside from reading skills, everyone must acquire the competence in fundamental operations and basic concepts of mathematics to face the challenges in this modern world. To achieve these, every student must fully understand such fundamental operations, mathematical laws and principles in problem solving for these are contributory in understanding some basic concepts in Science particularly in Chemistry. However, the students' lack of complete range of comprehension skills, such as understanding of the printed words, word meanings/vocabulary, memorizing symbols in the periodic table, word meaning, solving problems, and interpreting charts and graphs as well as inadequate mastery of the basic fundamental operations are perceived to be the cause of dismal and unsatisfactory performance in Chemistry.

For some personal and institutional considerations, this study focused on the performance of BS Criminology students under the author's tutelage. The researcher has been teaching Chemistry in the Criminology Department of the College of Arts and Sciences for two years and has found out his students low performance in the subject. Even though studies show that Filipino students did poorly in English, Mathematics and Science compared to their counterparts from other countries for some reasons to provide authentic data and add to the body of knowledge in ascertaining the problem, the author perceived the need to look into the association of mathematical ability and reading comprehension to the performance in Chemistry

subject to suggest possible improvement in instruction not only in the Criminology Department but also in the other Colleges of this institution where Chemistry is offered.

II. OBJECTIVES OF THE STUDY

This study aimed to determine the association of mathematical ability and reading comprehension skills to the chemistry performance of BS Criminology students of Naval Institute of Technology. Specifically, this study was conducted to:

1. determine the profile of the BS Criminology students of NIT in terms of: sex; high school graduated from; parents' occupation; average family income; time spent in studying Chemistry; grade in Math 111 and Math 122; and grade in English 111 and English 122.
2. find out the mathematical ability of the respondents;
3. find out the reading comprehension skills of the respondents;
4. determine their performance in Chemistry; and
5. find out whether significant associations exist between:
 - 5.1 students' profile and mathematical ability;
 - 5.2 students' profile and reading comprehension;
 - 5.3 students' profile and Chemistry performance;
 - 5.4 mathematical ability and Chemistry performance; and
 - 5.5 reading comprehension and Chemistry performance

III. FRAMEWORK OF THE STUDY

The focal point of this study intended to determine the Association of Mathematical Ability and the Reading Comprehension to the Chemistry Performance of BS in Criminology students of Naval Institute of Technology. The concept mainly delved on finding out the personal profile of the respondents as to: mathematical ability and the reading comprehension of the respondents. These parameters constitute the independent variables of this study. The mathematical ability and the reading comprehension skills of the BS in Criminology students were threshed out from the test conducted through the self-made questionnaire. The instrument covered five parts with twenty-seven questions - nine questions each for mathematical ability, reading comprehension and Chemistry related concepts. Before the test was administered to the respondents, a dry-run was conducted to ten engineering students taking Chemistry to test the comprehensibility of the instrument and to establish its reliability and validity.

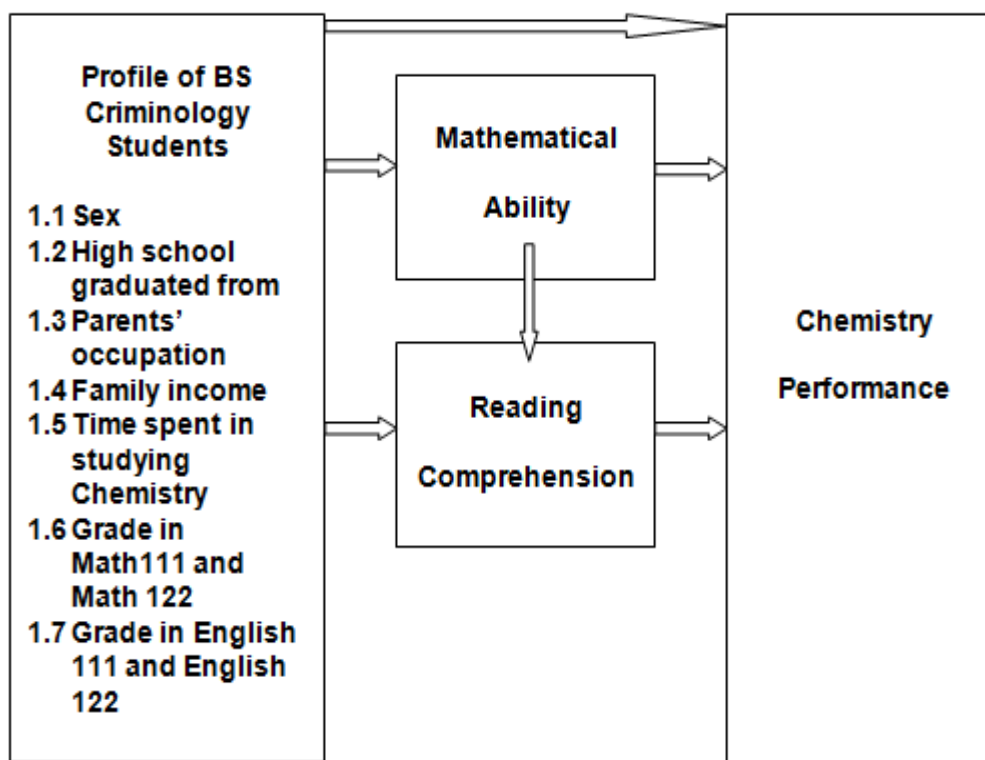


Figure 1. Conceptual Framework of the Study

Scope and Delimitation of the Study

This study included the four sections of the second year BS Criminology students of Naval Institute of Technology. The study focused on the association of mathematical ability and reading comprehension to the performance of chemistry of BS Criminology Students. The parameters were the students profile, the mathematical ability, the reading comprehension skills and the Chemistry performance. A total of 120 students were tapped as respondents.

IV. METHODOLOGY

The descriptive-correlation method of research was used in the study. This design is appropriate mainly because it attempted to determine the association of mathematical ability, reading comprehension skills, and Chemistry performance of BS Criminology students. The seat of this study was the Criminology Department under the College of Arts and Sciences of Naval State University. This study selected the 120 BS Criminology students of the Naval Institute of Technology taking Forensic Chemistry this second semester SY 2008-2009 as the main respondents. They were divided into four groups based on their respective sections. All were subjected to answer the self-made questionnaire that has passed a dry – run, validity test and the like. Results of test were interpreted using the statistical treatment suggested by school's renowned statistician. The instrument used in this study was a questionnaire. To determine the profile of the respondents, the frequency distribution with underlying percentage and average mean were applied. To determine the relationship between students' profile and mathematical ability, students' profile and reading comprehension, students' profile and Chemistry performance, the *Chi-square* was used. To determine the degree of relationship between mathematical ability and Chemistry performance, and reading comprehension and Chemistry performance, the Pearson Product Moment correlation was used.

V. RESULTS AND DISCUSSION

This section provides the results of the data collected by the researcher from randomly selected respondents of the study. Results are categorized, organized and presented based on the objectives of the study.

Profile of the BS Criminology Students of NIT

The respondents' profile included sex, high school graduated, parents' occupation, family income, hours spent in studying chemistry, and average grade in Mathematics and English. Table 1 portrays the profile of the second year BS Criminology students of Naval Institute of Technology.

Sex. As gleaned on the table, 92 or 76.7% were observed under the male category while 28 or 23.3% were females. Results show that most of the respondents are males and further imply that male respondents are largely dominant in terms of quantity or distribution among the second year BS Criminology students.

High school graduated. As portrayed in Table1, 116 or 96.7% of the respondents were graduates from different secondary schools in the region while only 4 or 3.3% were from private high school. It can be deduced that majority of the respondents obtained secondary education from public high school.

Table 1. Profile of the BS Criminology of Naval Institute of Technology

Profile of the Respondents	Frequency (f)	Percentage (%)
Sex	92	76.7
Male	28	23.3
Female		
High School Graduated	4	3.3
Private	116	96.7
Public		
Parents' Occupation		
Mother	93	77.5
Housekeeper	2	1.7
BHW	1	0.8
Not Indicated	9	7.5
Teacher	3	2.5
Dressmaker	3	2.5
Retailer	3	2.5
Government Employee	1	0.8
Nurse	1	0.8
Deceased	1	0.8

Hog Raiser	2	1.7
Sales Clerk	1	0.8
Brgy. Official		
Father	16	13.3
Fisherman	8	6.7
Driver	38	31.7
Farmer	14	11.7
Carpenter	4	3.3
Policeman	3	2.5
Retailer	6	5.0
Government Employee	2	1.7
Security Guard	12	10.0
Deceased	5	4.2
Utility worker	8	6.7
Not Indicated	2	1.7
Private Employee	2	1.7
Teacher		
Average Family Income per Month		
4,999 and below	52	43.3
5,000 – 9,999	41	34.2
10,000 – 14,999	15	12.5
15,000 – 19,999	5	4.2
20,000 – 30,000	7	5.8
Mean		
6,355.83		

Profile of the Respondents	Frequency (f)	Percentage (%)
Hours Spent in Studying Chemistry per Day		
0 – 0.25	0	0
0.26 – 0.5	46	38.4
0.51 – 0.75	0	0
0.74 – 1.0	72	60.0
1.1 – 1.5	1	0.8
1.6 – 2.0	1	0.8
Mean		0.78
Average Grade in Mathematics		
1.0 – 1.5	3	2.5
1.6 – 2.0	20	16.6
2.1 – 2.5	50	41.6
2.6 – 3.0	47	39.3
Mean		2.36
Average Grade in English		
1.0 – 1.5	8	6.7
1.6 – 2.0	24	20.0
2.1 – 2.5	46	38.3
2.6 – 3.0	42	35.0
Mean		2.29

Parents' occupation. As shown in the table, 93 or 77.5% of the respondents' mother were housekeepers and this is followed by the teachers at 7.5%. Dressmaker, retailer and government employee shared the same frequency of 3 or 2.5%. A frequency of 2 or 1.7 percent was manifested with BHW and sales clerk while the rest of the listed occupation belonged to the frequency of 1 or 0.8 percent. More than one-fourth (31.7%) of the respondents' fathers were farmers. Others claimed at 13.3 percent were sons and daughters of fishermen. This is followed by siblings of carpenters and "deceased" at (14) or 11.7 percent and (12) or 10 percent respectively. Occupations of "a driver" and "not indicated" had the same frequency of 8 or 6.7 percent. A government employee had (6) or 5 percent, while (5) or 4.3 percent belonged to utility worker. A policeman and a retailer were next to the list with (4) or 3.3 percent and a frequency of 3 or 2.5 percent respectively. The last group was

represented by the teacher, private employee, and security guard with each manifesting a frequency of 2 or 1.7 percent. It can be gleaned from this data that a large number of the respondents' parents especially the mothers are unemployed.

Average family income per month. Average family income means that the father, mother and any member of the family pooled their resources together to make income every month. A large bulk of the respondents claimed that their parents' total monthly income fell at 4999 pesos and below (52) for 43.3 percent. This is followed by (41) 43.2% whose parents earned only 5000 to 9,999 per month. Only 15 of the 120 or (12.5%) respondents revealed that their parents had total monthly income of 10,000 to 14,999. Seven of the respondents (5.8%) expressed that they had 20,000 to 30,000 income per month while five of the respondents (4.2%) claimed that they only had 15,000 to 19,999 pesos to spend per month. The over-all mean was 6,355.83 which can be traced to the 5,000 to 9,999 category. Results would connote that most of the respondents' family income is only meager.

Hours spent in studying Chemistry per day. Majority of the respondents fell under 0.76 to 1 hour category with a frequency of 72 or 60 percent while 46 or 38.4 percent of the respondents belonged to 0.26 to 0.5 hour level. An identical frequency of 1 or 0.8 percent of the respondents spent at 1.1 to 1.5 hour and 1.6 to 2 hour category. The computed mean was 0.779 hour which is under the category of 0.76 to 1 hour. This would mean that the number of hours spent by the respondents in studying Chemistry per day is not sufficient.

Average grade in Mathematics and English. On the grade level of 1 to 1.5, the respondents got a frequency of 3 or 2.3 percent in mathematics while a frequency of 8 or 6.7 percent was in English. For the grade level of 1.6 to 2.0, a frequency of 20 or 16.6 percent of the respondents were in this category in Mathematics; whereas, English had a frequency of 24 or 20 percent. On the 2.1 to 2.5 grade level, (50) or 41.6 percent fell under this level in Mathematics while in English posted a frequency of 46 or 38.3 percent. The last category posted 2.6 to 3.0 with a frequency of 47 or 39.3 percent manifested under this category in Mathematics while (42) or 35 percent was in English. The mean in Mathematics was 2.36 while the average grade in English had a mean of 2.29. By comparison, both means fell under the grade level of 2.1 to 2.5. This means that only few of the respondents are better-performing in Mathematics and English.

Level of Performance of Respondents in Mathematical Ability, Reading Comprehension Skills, and Chemistry

Performance in mathematical ability. Mathematical ability is the ability of the student to manipulate the different operations in mathematics. There were 9 items test used to determine the mathematical ability of the respondents. This is categorized as 7-9, 4-6, 0-3 category. This is presented in Table 2.

Table 2. Mathematical Ability of the Respondents

Score	Description	f	%
7 – 9	High	2	1.7
4 – 6	Average	57	47.5
0 – 3	Low	61	50.8
Total		120	100
Mean		1.51	

Table 2 shows that (61) or 50.8 percent of the respondents registered a “low” level description in mathematical ability. Fifty-seven of respondents (47.5%) reached the “average” description and only (2) or 1.7 percent had “high” level description in mathematical ability. Over-all performance of the respondents was considered “low” with a computed mean of 1.51. This would imply that the respondents need enhancement of mathematical ability.

Performance in reading comprehension skill. Reading comprehension skill is the act of using knowledge and skill possess by the respondents to process the information presented. There were 9 items test used to determine the reading comprehension skill of the respondents. This is categorized as 7-9, 4-6, 0-3 category. This is presented in Table 3.

Table 3. Reading Comprehension Skill of the Respondents

Score	Description	f	%
7 – 9	High	18	15.0
4 – 6	Average	66	55.0
0 – 3	Low	36	30.0
Total		120	100
Mean		1.85	

As presented in the table, majority of the respondents (55%) were on the “average” description followed by 30% and 15% for “low” and “high” level of description respectively. The over-all mean was 1.85

which can be traced at “low” level description. This would mean that the description of reading comprehension of the respondents is not high or good and this needs to be improved.

Performance in Chemistry. Chemistry performance of the respondents was determined by giving them 9 items test which comprised chemistry related word problems. This is categorized as 7-9, 4-6, 0-3 category. This is presented in Table 4.

Table 4. Chemistry Performance of the Respondents

Score	Description	f	%
7 – 9	High	2	1.7
4 – 6	Average	23	19.2
0 – 3	Low	95	79.2
Total		120	100
Mean		1.23	

As revealed in the table, majority of the respondents fall under “low” level description in Chemistry with a frequency of 95 or 79.2 percent. Next in rank were the 23 respondents at 19.2% with an “average” level while only 1.7% of the respondents were on the “high” level description.

The over-all result of the respondents in Chemistry was “low” with a mean of 1.23. This only means that the respondents perform poorly in Chemistry.

Relationship Between Students’ Profile and Mathematical Ability, Students’ Profile and Reading Comprehension, and Students’ Profile and Chemistry Performance

Students’ profile and mathematical ability. The profile of the student was correlated to the mathematical ability using the Chi-square. This is presented in Table 5.

Table 5. Students’ Profile and Mathematical Ability

Variables	df	X ² (Computed Value)	X ² (Table Value)	Interpretation
Sex & Mathematical ability	2	5.679	5.991	Not significant
High school graduated & Mathematical ability	2	3.980	5.991	Not significant
Mother’s occupation & Mathematical ability	22	23.242	33.924	Not significant
Father’s occupation & Mathematical ability	24	30.090	36.415	Not significant
Family income % Mathematical ability	8	9.736	15.507	Not significant
Hours in spent in studying Chemistry & Mathematical ability	6	10.421	12.592	Not significant
Grade in Mathematics & Mathematical ability	6	15.782	12.592	Significant
Grade in English & Mathematical ability	6	40.154	12.592	Significant

Table 5 shows the relationship of students’ profile and their mathematical ability. After using appropriate statistical tools, the researcher found out that only two among the eight variables are interpreted as significant in terms of students’ mathematical ability. These were the Grade in Mathematics and the Grade in English which posted higher computed X² value of 15.782 and 40.154 respectively as compared with the table X² values of 12.592. The rest of the variables had lower computed X² value than the table X² value. Results would imply that the respondents’ grades in Mathematics and English have influence on their mathematical skills and abilities.

Students’ profile and reading comprehension skills. To determine the relationship between students’ profile and reading comprehension skills, the Chi-square was used. This is presented in Table 6. .

Table 6. Students’ Profile and Reading Comprehension Skills

Variables	df	X ² (Computed Value)	X ² (Table Value)	Interpretation
Sex & Reading comprehension skills	2	1.895	5.991	Not significant
High school graduated & Reading comprehension skills	2	3.386	5.991	Not significant
Mother’s occupation & Reading comprehension skills	22	20.025	33.924	Not significant
Father’s occupation & Reading comprehension skills	24	34.125	36.415	Not significant
Family income & Reading comprehension skills	8	10.913	15.507	Not significant

Hours in spent in studying Chemistry& Reading comprehension skills	6	11.256	12.592	Not significant
Grade in Mathematics & Reading comprehension skills	6	12.578	12.592	Not significant
Grade in English & reading comprehension skills	6	17.345	12.592	Significant

As provided in the table, the relationship of students' profile versus students' reading comprehension skills reveal that only the grade in English was significant on student reading comprehension skills with a computed X^2 value of 17.345 which is greater than the table X^2 value of 12.592. The rest of the variables had lower computed value than the table value and perceived to be not significant on students' reading comprehension skills. Based on the data, it could be noted that the performance of the students in English affects their comprehension skills.

Students' profile and Chemistry performance. The relationship between students' profile and Chemistry performance was determined using the *Chi-square*. This is presented in Table 7.

Table 7. Students' Profile and Chemistry Performance

Variables	df	X^2 (Computed Value)	X^2 (Table Value)	Interpretation
Sex & Chemistry performance	2	0.97	5.991	Not significant
High school graduated & Chemistry performance	2	1.093	5.991	Not significant
Mother's occupation & Chemistry performance	22	28.408	33.924	Not significant
Father's occupation & Chemistry performance	24	29.831	36.415	Not significant
Family income & Chemistry performance	8	8.658	15.507	Not significant
Hours in spent in studying Chemistry& Chemistry performance	6	8.536	12.592	Not significant
Grade in Mathematics & chemistry performance	6	64.531	12.592	Significant
Grade in English & Chemistry performance	6	21.902	12.592	Significant

Results shown in table 7 are the relationship of students' profile versus students' performance in Chemistry. After the computation of the respective X^2 value of each variable, the researcher found out that the grades in Mathematics and English played a significant role on their performance in Chemistry as reflected by the higher computed X^2 value than the table value. The rest of the variables were found out not significant. It would denote that both Mathematics and English performance have influence on the students Chemistry performance.

Relationship Between Mathematical Ability and Chemistry Performance, and Reading Comprehension and Chemistry Performance

To determine the degree of relationship between mathematical ability and Chemistry performance, and reading comprehension and Chemistry performance, the Pearson Product Moment correlation was used. To test the significance of each variables, t-test was used. This is presented in Table 8.

Table 8. Relationship between Mathematical Ability and Chemistry Performance, and Reading Comprehension Skills and Chemistry Performance

Variables	N	r_{xy}	Computed t - value	Table value	Interpretation
Mathematical ability & Chemistry performance	120	0.805	/14.739/	>1.9804	Significant
Reading comprehension & Chemistry performance	120	0.682	/10.129/	>1.9804	Significant

Relationship between mathematical ability and Chemistry performance. As reflected on the table, the r value was 0.805 while the computed t-value was /14.739/. Since the t-value is greater than the table value (1.9804), the null hypothesis was rejected at $\alpha = 0.05$. Therefore, mathematical ability of the respondents is significantly correlated with their chemistry performance.

Relationship between reading comprehension and Chemistry performance. On the reading comprehension versus chemistry performance, the r value was 0.682 with a computed t-value of /10.129/. Since this is less than the table value of 1.9804, the null hypothesis was rejected at 0.05. Therefore, the reading comprehension skill of the respondents and chemistry performance are significantly correlated.

VI. CONCLUSIONS

Based on the findings, the following conclusions were drawn: There are more male than female respondents. Majority of the respondents are graduates of public high school. The main occupation of the respondents' parents are farming and housekeeping. Almost of the respondents' households have meager monthly income. Almost all of the respondents spend less than an hour studying Chemistry everyday. The respondent's average grade in Mathematics and English are generally satisfactory. The level of performance of the respondents in mathematical ability, reading comprehension skill and chemistry are low. There is a significant relationship between the average grade in Mathematics and English on the mathematical ability of the respondents. The average grade in English of the respondents is significantly related to their reading comprehension skills. The respondents' average grade in Mathematics and English is significant to their Chemistry performance. Mathematical ability and reading comprehension skills are significant to the performance of the students.

VII. RECOMMENDATIONS

Based on the findings and conclusions of the study, the following recommendations are forwarded: Parents and teachers should work hand in hand to encourage the students to spend more time studying Chemistry everyday. Teachers should design stimulating materials, enhance activities and employ remedial measures to help motivate students and raise their interest in learning Chemistry which is the means to address issues and problems on poor academic performance on the subject. English and Mathematics teachers are encouraged to design learning materials and tools which would develop the reading comprehension skills and abilities of students. There is also a need for teachers to be updated and upgraded with the current trends in teaching Chemistry which necessitates them to attend seminars and trainings to expand their knowledge and skills in teaching the subject. Parallel studies on this nature and subject but looking at other gaps and aspects may be conducted to ascertain greater reliability and validity of the data generated and to contribute to the body of knowledge.

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