# A GENDER COMPARISON
of

# ACADEMIC PREPARATION
and

# GENERAL CHEMISTRY SUCCESS

AS SEEN IN

TWO APPROACHES TO INSTRUCTION

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A Gender Comparison Of The Relationship Of
Academic Preparation And General Chemistry Success
As Seen In Two Approaches To Instruction

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TABLE OF CONTENTS

Section I: Introduction 1

Section I-A: Background and Purpose of the Study 1

Section I-B: Organization of the Report 2

Section II: Preparation for and Success in General Chemistry: Chemistry Class/Gender Analysis 3

Section II-A: Rationale and Procedure 3

Section II-B: Within Class/Between Gender Comparisons 4

Section II-C: Within Gender/Between Class Comparisons 6

Section III: Relationships of Preparation Variables to Chemistry Success Variables: Chemistry Class/Gender Analysis 8

Section III-A: Rationale and Procedure 8

Section III-B: Preparation and Chemistry Class GPA Correlations: Within Class/Between Gender Comparisons 9

Section III-C: Preparation and Chemistry Class GPA Correlations: Within Gender/Between Class Comparisons 10

Section III-D: Preparation and ACS Final Scores Correlations: Within Class/Between Gender Comparisons 12

Section III-E: Preparation and ACS Final Scores Correlations: Within Gender/Between Class Comparisons 14

Section IV: Summary and Interpretations of Study Results 16

Section IV-A: The purpose Restated 16

Section IV-B: Interpretations and Suggestions for Future Studies 17

TABLES

Table 1: Academic Preparation and Success by Chemistry Class and Gender 18

Table 1-A: Academic Preparation and Success by Chemistry Class and Genbder: Symbolic Summary 20

Table 1-B; Academic Preparation and Success by Gender and Chemistry Class: Symbolic Summary 21

Table 2: Correlations of Academic Preparation with First Semester Chemistry Class Success by Chemistry Class and Gender 22

Table 2-A: Correlations of Academicf Preparation with First Semester Chemistry Class Success by Chemistry Class and Gender: Symbolic Interpretation 24

Table 2-B: Correlations of Academic Preparation with First Semester Chemistry Class Success by Gender and Chemistry Class: Sumbolic Summary 25

Table 3: Correlations of Academic Preparation with ACS Standardized Final Examination Scores by Chemistry Class and Gender 26

Table 3-A: Correlations of Academic Preparation with ACS Standardized Final Examinations Scores by Chemistry Class and Gender: Symbolic Analysis 28

Table 3-B: Correlations of Academic Preparation with ACS Standardized Final Examination Scores by Gender and Chemistry Class: Symbolic Analysis 29

TABLE OF CONTENTS


Section I: Introduction 1

Section I-A: Background and Purpose of the Study 1

Section I-B: Organization of the Report 2

Section II: Preparation for and Success in General Chemistry: Chemistry Class/Gender Analysis 3

Section II-A: Rationale and Procedure 3

Section II-B: Within Class/Between Gender Comparisons 4

Section II-C: Within Gender/Between Class Comparisons 6

Section III: Relationships of Preparation Variables to Chemistry Success Variables: Chemistry Class/Gender Analysis 8

Section III-A: Rationale and Procedure 8

Section III-B: Preparation and Chemistry Class GPA Correlations: Within Class/Between Gender Comparisons 9

Section III-C: Preparation and Chemistry Class GPA Correlations: Within Gender/Between Class Comparisons 10

Section III-D: Preparation and ACS Final Scores Correlations: Within Class/Between Gender Comparisons 12

Section III-E: Preparation and ACS Final Scores Correlations: Within Gender/Between Class Comparisons 14

Section IV: Summary and Interpretations of Study Results 16

Section IV-A: The purpose Restated 16

Section IV-B: Interpretations and Suggestions for Future Studies 17

TABLES


Table 1: Academic Preparation and Success by Chemistry Class and Gender 18

Table 1-A: Academic Preparation and Success by Chemistry Class and Genbder: Symbolic Summary 20

Table 1-B; Academic Preparation and Success by Gender and Chemistry Class: Symbolic Summary 21

Table 2: Correlations of Academic Preparation with First Semester Chemistry Class Success by Chemistry Class and Gender 22

Table 2-A: Correlations of Academicf Preparation with First Semester Chemistry Class Success by Chemistry Class and Gender: Symbolic Interpretation 24

Table 2-B: Correlations of Academic Preparation with First Semester Chemistry Class Success by Gender and Chemistry Class: Sumbolic Summary 25

Table 3: Correlations of Academic Preparation with ACS Standardized Final Examination Scores by Chemistry Class and Gender 26

Table 3-A: Correlations of Academic Preparation with ACS Standardized Final Examinations Scores by Chemistry Class and Gender: Symbolic Analysis 28

Table 3-B: Correlations of Academic Preparation with ACS Standardized Final Examination Scores by Gender and Chemistry Class: Symbolic Analysis 29

# A GENDER COMPARISON OF THE RELATIONSHIP OF ACADEMIC PREPARATION AND GENERAL CHEMISTRY SUCCESS AS SEEN IN TWO APPROACHES TO INSTRUCTION

## Section I

## Introduction

### Section I-A:
### Background and Purpose of the Study

The purpose of this study is to determine if there is a gender difference in general chemistry success as a result of the Peer-Led Team Learning (PLTL) approach to instruction in general chemistry.

This presentation is an extended part of a study of the impact the PLTL program in general chemistry at Miami University, Oxford, Ohio. The data collected for that study during the fall semester of 2002 included the gender of the student. Therefore we are in a position to study the male/female differences in their preparation for and success in general chemistry in CHM 137 (the PLTL) and CHM 141 (the non-PLTL) approaches to instruction. This is a report on that analysis.

The Chemistry Department, Miami University—Oxford, collected the data. The University's Computer and Information Center computed the statistics. The authors of this report developed the data presentation tables, summarized the relationships, and provided the interpretations and implications of the data.

High school grade point average, class standing (percentile rank), gender, and ACT and SAT scores were obtained from the University admissions records of all students enrolled in CHM 137 and the selected comparison CHM 141 class. The grades for the chemistry classes, chemistry laboratory classes, total semester grade point average, and ACS standardized final examination scores were obtained from University and departmental records. The student numbers used represent the total universe of interest, not necessitating tests of significance.

## Section I-B:
## Organization of the Report

The analysis is divided into four sections. This Section I provides an overview and organization of the study.

Section II compares the arithmetic mean of nine academic preparation variables and four measures of success in general chemistry. The data is presented for each class-by-gender group. The standard deviation and respondent numbers are included.

Section III presents the relationships of the preparation variables to two success variables using the correlation coefficient as the analytical tool. The success variables for this portion of the study are chemistry class grade point average (GPA) and the American Chemical Society (ACS) standardized final exam score.

Since the correlation coefficient is a measure of the degree to which two variables vary together, the higher the correlation figure, the more the variables are related. This analysis questions what, if any, relationship (or "influence") the preparation variables have to the success variables for each of the class/gender groups

Section IV presents the summary and the authors' interpretations and suggestions for further study.

The data utilized in this report are presented in the Appendix in three tables:

Table 1: Academic Preparation and Success in General Chemistry by Chemistry Class and Gender.

This table presents the arithmetic means of the variables by class/gender groups.

Table 2: Correlations of Academic Preparation with First Semester Chemistry Class Success by Chemistry Class and Gender.

This table shows the relationship of preparation with achievement as measured by the chemistry class grade point average based on correlation coefficients.

Table 3: Correlations of Academic Preparation with ACS Standardized Final Examination Test Scores by Chemistry Class and Gender.

This table shows the relationship of preparation with achievement as measured by the ACS standardized test based on correlation coefficients.

# Section II

## Preparation for and Success in General Chemistry: Chemistry Class/Gender Analysis

### Section II-A: Rationale and Procedure

Table I, Academic Preparation and Success by Chemistry Class and Gender, presents the arithmetic means of the preparation variables and the success variables. Also included are standard deviations and number of students, although neither of these two measures is considered in this discussion.

The mean values on the variety of preparation measures are generally high. This is expected, given the selectivity of the University, and desired, from the perspective of the professors. However from the perspective of research it presents an analytical question: how much difference is an important difference?

The mean values for high school GPAs, ACT, and SAT scores are quite similar for both classes. GPAs differ by only 0.31 of a grade point on 4.00 scale. The largest ACT score difference is the English measure with a 3.27 point difference in a range of 23.48 to 26.75. The largest SAT score difference is 64.47 for the mathematics measure in a range of 565.29 to 629.76.

The question of the importance of these differences is not addressed in this study. For the purposes of the study the high similarity has been noted. When differences are reported in the group means it should be remembered that the population for this study is a highly select one relative to academic preparation and achievement. Therefore it should be remembered that these are small differences within a larger range of scores.

## Section II-B:
## Within Class/Between Gender Comparisons

The data for this Section are presented in Table I. In this section the within class/between gender comparisons of mean values are summarized in listing fashion.

1. HIGH SCHOOL PREPARATION: GPA AND PERCENTILE RANK

| | | |
|---|---|---|
| High school GPA: | CHM 137 | females higher mean value than males |
| | CHM 141 | females higher mean value than males |
| High school percentile rank: | CHM 137 | females better mean value than males |
| | CHM 141 | males better mean value than females |

The consideration of a "low" percentile rank as "higher" or "better" than a "high" percentile rank may appear counter-intuitive. For many studies high percentile ranks reflect higher abilities. However in high school class standing the procedure is reversed: the student with the highest GPA is ranked first percentile. Therefore the group with the "lowest" number has the "highest" or "better" rank.

2. GENERAL ABILITIES PREPARATION: ACT SCORES

| | | | |
|---|---|---|---|
| ACT | Composite: | CHM 137 | females higher mean value than males |
| | | CHM 141 | males higher mean value than females |
| | Science: | CHM 137 | males higher mean value than females |
| | | CHM 141 | males higher mean value than females |
| | Mathematics: | CHM 137 | females higher mean value than males |
| | | CHM 141 | females higher mean value than males |
| | Reading: | CHM 137 | females higher mean value than males |
| | | CHM 141 | males higher mean value than females |
| | English: | CHM 137 | females higher mean value than males |
| | | CHM 141 | females higher mean value than males |

3. GENERAL ABILITIES PREPARATION**:** SAT SCORES

| | | | |
|---|---|---|---|
| SAT | Verbal: | CHM 137 | males higher mean value than females |
| | | CHM 141 | males higher mean value than females |
| | Mathematics: | CHM 137 | males higher mean value than females |
| | | CHM 141 | males higher mean value than females |

4. COLLEGE SUCCESS**:** CHEMISTRY AND SEMESTER GPA AND ACS FINAL SCORES

| | | |
|---|---|---|
| General Chemistry GPA: | CHM 137 | males higher mean value than females |
| | CHM 141 | males higher mean value than females |
| Chemistry Laboratory GPA: | CHM 137 | females higher mean value than males |
| | CHM 141 | females higher mean value than males |
| Total Fall Semester GPA: | CHM 137 | females higher mean value than males |
| | CHM 141 | females higher mean value than males |
| ACS Standardized Final: | CHM 137 | males higher mean value than females |
| | CHM 141 | males higher mean value than females |

5. SUMMARY OF COMPARISONS:

The comparison of males and females within each class indicates the high similarity of the gender groups. The higher means are noted for each of the gender comparisons. Table 1-A presents the data in focused symbolic form**:** a plus indicates which gender for each class had the higher mean score. The pattern of the pluses is easier to read than the numbers of Table 1.

The females of CHM 137 have higher mean scores on more preparation factors that the CHM 137 males. On the chemistry success variables, the CHM 137 males have higher means on overall college semester GPA and ACS final exam; the CHM 137 females have the higher mean values on the chemistry laboratory GPA and chemistry class GPA.

A similar pattern is seen with the CHM 141 class, however, in that class the males have consistently the higher mean values on most of the preparation factors. On the chemistry success variables, the pattern for CHM 141 is the same as for CHM 137.

## Section II-C:
## Within Gender/Between Class Comparisons

The data for this Section are presented in Table 1. In this section the within gender/between class comparisons are summarized in listing fashion.

1. HIGH SCHOOL PREPARATION: GPA AND PERCENTILE RANK

| | | |
|---|---|---|
| High school GPA: | Females | CHM 141 higher mean value than CHM 137 |
| | Males | CHM 141 higher mean value than CHM 137 |
| High school percentile rank: | Females | CHM 141 better mean value than CHM 137 |
| | Males | CHM 141 better mean value than CHM 137 |

2. GENERAL ABILITIES PREPARATION: ACT SCORES

| | | | |
|---|---|---|---|
| ACT | Composite: | Females | CHM 141 higher mean value than CHM 137 |
| | | Males | CHM 141 higher mean value than CHM 137 |
| | Science: | Females | CHM 141 higher mean value than CHM 137 |
| | | Males | CHM 141 higher mean value than CHM 137 |
| | Mathematics: | Females | CHM 141 higher mean value than CHM 137 |
| | | Males | CHM 141 higher mean value than CHM 137 |
| | Reading: | Females | CHM 141 higher mean value than CHM 137 |
| | | Males | CHM 141 higher mean value than CHM 137 |
| | English: | Females | CHM 141 higher mean value than CHM 137 |
| | | Males | CHM 141 higher mean value than CHM 137 |

3. GENERAL ABILITIES PREPARATION: SAT SCORES

| | | | |
|---|---|---|---|
| SAT | Verbal: | Females | CHM 141 higher mean value than CHM 137 |
| | | Males | CHM 137 higher mean value than CHM 141 |
| | Mathematics: | Females | CHM 141 higher mean value than CHM 137 |
| | | Males | CHM 141 higher mean value than CHM 137 |

4. COLLEGE SUCCESS**:** CHEMISTRY CLASS, LABORABORY, TOTAL SEMESTER GPA AND ACS FINAL SCORES

| | | |
|---|---|---|
| General Chemistry GPA: | Females | CHM 137 higher mean value than CHM 141 |
| | Males | CHM 141 higher mean value than CHM 137 |
| Chemistry Laboratory GPA: | Females | CHM 141 higher mean value than CHM 137 |
| | Males | CHM 141 higher mean value than CHM 137 |
| Total Fall Semester GPA; | Females | CHM 141 higher mean value than CHM 137 |
| | Males | CHM 141 higher mean value than CHM 137 |
| ACS Standardized Final: | Females | CHM 137 higher mean value than CHM 141 |
| | Males | CHM 141 higher mean value than CHM 137 |

5. SUMMARY OF COMPARISONS:

The females of CHM 141 have higher mean values on all of the preparation variables and on the chemistry laboratory and overall semester GPA. The females of CHM 137 have higher mean values on the chemistry class GPA and the ACS final exam score.

The CHM 141 males have higher mean values in all of the preparation variables except the verbal portion of the SAT. The CHM 141 males also have higher mean values on all four success variables.

The numerical values for these mean values show small differences. The pattern of differences is symbolically summarized in Table 1-B.

# Section III:

## Relationships of Preparation Variables to Chemistry Success Variables: Chemistry Class/Gender Analysis

## Section III-A: Rationale and Procedure

This section presents the analysis of the relationships of the nine high school preparation variables to the two chemistry success variables. The statistical tool used in this analysis is the correlation coefficient. Probability figures and student numbers are presented for the reader's information, but are not discussed in this analysis.

As noted earlier the correlation coefficient is a measure of the degree to which variables vary together. This simply means that the higher the correlation figure, the more the variables are related. If a "causal" interpretation is included, then the correlation coefficient is a measure of the degree to which the "independent" variable "influences or causes" the "dependent" variable.

As an example: The first comparison in Table 2 is the gender differences in the relationship of high school GPA and chemistry class GPA. For the CHM 137 females this figure is 0.43 and for the CHM 137 males it is 0.35. This difference is an indication of the "strength" of relationship between the variables or the "influence" the independent variable (high school GPA) has on the dependent variable (chemistry class GPA). The higher the correlation the more the relationship or influence.

The analysis of Table 2 considering the relationship between students' academic preparation and chemistry class GPA follows the same procedure as that used in Table 1. Section III-B presents the within class/between gender relationship. The gender with the higher correlation coefficient will be noted. Following this summary of specific variable relationships the more general summary of the relationships is presented. A similar analysis will be presented in Section III-C for the within gender/between chemistry class consideration.

The analysis of the date in Table 3 considers the relationship between the academic preparation with the scores on the ACS standardized final exam. The between gender/within class correlations are presented in Section III-D and the within gender/ between classes correlations are presented in Section III-E. Following each a general summary of the observed relationships is given.

Correlation coefficient scores for educational/psychological/sociological data usually range between 0.20 to 0.60. Therefore the pattern of correlation values obtained in this study are within the normally expected range for this type of data.

## Section III-B:
## Preparation and Chemistry Class GPA Correlations:
## Within Class/Between Gender Comparisons

The data for this analysis is presented in Table 2. In this section the within class/between gender comparisons are summarized in listing fashion.

1. HIGH SCHOOL PREPARATION AND CHEMISTRY CLASS GRADES**:**
GPA AND PERCENTILE RANK

| | | |
|---|---|---|
| High school GPA: | CHM 137 | females higher correlation than males |
| | CHM 141 | females higher correlation than males |
| High school percentile rank: | CHM 137 | females correlation higher than males |
| | CHM 141 | females correlation higher than males |

Note on the negative correlations of high school percentile class standing and the chemistry class GPA. This was mentioned in Section II when the information in Table 1 on means was presented. High school percentile rank accords the student with the highest GPA the first percentile and the student with the lowest GPA the $100^{th}$ percentile. This is in reverse order to the usual use of percentiles. Therefore the relationship computed for these variables is negative in a technical sense—if the percentile ranking were reversed the relationship would be positive. The more important consideration is that the relationships are substantial.

2. GENERAL ABILITIES PREPARATION AND CHEMISTRY CLASS GRADES**:**
ACT SCORES

| | | | |
|---|---|---|---|
| ACT | Composite: | CHM 137 | females higher correlation than males |
| | | CHM 141 | males higher correlation than females |
| | Science: | CHM 137 | females higher correlation than males |
| | | CHM 141 | males higher correlation than females |

| | | | |
|---|---|---|---|
| | Mathematics: | CHM 137 | males higher correlation than females |
| | | CHM 141 | males higher correlation than females |
| | Reading: | CHM 137 | females higher correlation than males |
| | | CHM 141 | males higher correlation than females |
| | English: | CHM 137 | females higher correlation than males |
| | | CHM 141 | males higher correlation than females |

3. GENERAL ABILITIES PREPARATION AND CHEMISTRY CLASS GRADES: SAT SCORES

| | | | |
|---|---|---|---|
| SAT | Verbal: | CHM 137 | females higher correlation than males |
| | | CHM 141 | males higher correlation than females |
| | Mathematics: | CHM 137 | females higher correlation than males |
| | | CHM 141 | females higher correlation than males |

4. SUMMARY OF COMPARISONS:

CHM 137 females had higher correlations for all relationships than CHM 137 males with the exception of the ACT mathematics/chemistry class semester grade relationship.

CHM 141 males had higher correlations for all relationships than CHM 141 females with the exception of high school preparation/chemistry class semester grade correlation.

## Section III-C:
## Preparation and Chemistry Class Success Correlations:
## Within Gender/Between Class Comparisons

The data for this analysis is presented in Table 3. In this section the within gender/between class comparisons are summarized in listing fashion.

1. HIGH SCHOOL PREPARATION AND CHEMISTRY CLASS GRADES: GPA AND PERCENTILE RANK

| | | |
|---|---|---|
| High school GPA: | Females | CHM 137 higher correlation than 141 |
| | Males | CHM 137 higher correlation than 141 |
| High school percentile rank: | Females | CHM 137 higher correlation than 141 |
| | Males | CHM 137 higher correlation than 141 |

2. GENERAL ABILITIES PREPARATION AND CHEMISTRY CLASS GRADES: ACT SCORES

| | | | |
|---|---|---|---|
| ACT | Composite: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |
| | Science: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |
| | Mathematics: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 137 higher correlation than 141 |
| | Reading: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |
| | English: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |

3. GENERAL ABILITIES PREPARATION AND CHEMISTRY CLASS GRADES: SAT SCORES

| | | | |
|---|---|---|---|
| SAT | Verbal: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |
| | Mathematics: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |

4. SUMMARY OF COMPARISONS:

CHM 137 females had higher correlations for all preparation/chemistry class GPA relationships than CHM 141 females.

CHM 141 males had higher correlations for all preparation/chemistry class GPA relationships than CHM 137 males except for the three relationships of high school GPA, ACT mathematics, and SAT mathematics to chemistry class GPA.

## Section III-D:
## Preparation and ACS Final Scores Correlations
## Within Class/Between Gender Comparisons

The American Chemical Society (ACS) Standardized Final Examination was administered to the students in the two chemistry classes as a control on the variations of individual class grading systems. It is used in this study as a comparative dependent variable to the individual chemistry class grade point average. The analyses in this section and Section III-E will permit a consideration of the consistency of study results between two dependent variables: chemistry class GPA and ACS examination.

The high correlations between the chemistry class GPA and ACS final examination scores for all of the groups (ranging from 0.84 to 0.93) indicate the strong relationship between these two success variables. This data is presented in both Table 2 and Table 3.

The procedure in this section addresses the relationship between academic preparation and the ACS final exam scores. The within class/between gender comparisons are summarized in listing fashion. This data is presented in Table 3.

1. HIGH SCHOOL PREPARATION AND ACS FINAL EXAMINATION: GPA AND PERCENTILE RANK

| | | |
|---|---|---|
| High school GPA: | CHM 137 | females and males equal correlations |
| | CHM 141 | females higher correlation than males |
| High school percentile rank: | CHM 137 | males higher correlation than females |
| | CHM 141 | females higher correlation than males |

2. GENERAL ABILITIES PREPARATION AND ACS FINAL EXAMINATION: ACT SCORES

| | | |
|---|---|---|
| ACT Composite: | CHM 137 | females higher correlation than males |
| | CHM 141 | males higher correlation than females |

| | | | |
|---|---|---|---|
| | Science: | CHM 137 | females higher correlation than males |
| | | CHM 141 | males higher correlation than females |
| | Mathematics: | CHM 137 | males higher correlation than females |
| | | CHM 141 | males higher correlation than females |
| | Reading: | CHM 137 | males higher correlation than females |
| | | CHM 141 | males higher correlation than females |
| | English: | CHM 137 | females higher correlation than males |
| | | CHM 141 | males higher correlation than females |

3. GENERAL ABILITIES PREPARATION AND ACS FINAL EXAMINATION: SAT SCORES

| | | | |
|---|---|---|---|
| SAT | Verbal: | CHM 137 | females higher correlation than males |
| | | CHM 141 | males higher correlation than females |
| | Mathematics: | CHM 137 | females higher correlation than males |
| | | CHM 141 | females higher correlation than males |

4. SUMMARY OF COMPARISONS:

CHM 137 males and females were fairly evenly matched on the relationships between the preparatory measures for university work and chemistry class achievement as measured by ACS exam scores. Males had the higher correlations on four of the items. Females had higher correlations on five of the items. On one of the items they were tied.

CHM 141 males had consistently higher correlations on more of the preparatory items with the chemistry class achievement as measured by ACS exam scores than did CHE 141 females. Males had higher correlations on seven of the ten (7 of 10) items. Females had the higher correlation values on three of the items.

## Section III-E:
## Preparation and ACS Final Scores Correlations:
## Within Gender/Between Classes

The data for this section are presented in Table 3. This section summarizes the comparisons of the relationships within gender between the classes in listing fashion.

1. HIGH SCHOOL PREPARATION AND ACS FINAL SCORES**:**
GPA AND PERCENTILE RANK

| | | |
|---|---|---|
| High school GPA: | Females | CHM 137 and 141 equal correlations |
| | Males | CHM 137 higher correlation than 141 |
| High School percentile rank: | Females | CHM 141 higher correlation than 137 |
| | Males | CHM 137 higher correlation than 141 |

2. GENERAL ABILITIES PREPARATION AND ACS FINAL SCORES**:**
ACT SCORES

| | | | |
|---|---|---|---|
| ACT | Composite: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |
| | Science: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |
| | Mathematics: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 137 and 141 equal correlations |
| | Reading: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |
| | English: | Females | CHM 137 higher correlation than 141 |
| | | Males | CHM 141 higher correlation than 137 |

3. GENERAL ABILITIES PREPARATION AND ACS FINAL SCORES**:**
SAT SCORES

| | | | |
|---|---|---|---|
| SAT | Verbal: | Females | CHM 141 higher correlation than 137 |
| | | Males | CHM 141 higher correlation than 137 |

| | | |
|---|---|---|
| Mathematics: | Females | CHM 141 higher correlation than 137 |
| | Males | CHM 137 higher correlation than 141 |

4. SUMMARY OF COMPARISONS:

The CHM 137 females had higher correlations for six of the relationships with ACS final scores than the CHM 141 females. CHM 141 females had higher correlations for three of the relationships with ACS final scores than the CHM 137 females. The CHM 137 and CHM 141 females had the same correlation coefficient for the high school GPA/ACS final scores comparison.

The CHM 141 males had higher correlations for six of the relationships than the CHM 137 males. CHM 137 males had higher correlations for three relationships than CHM 141 males. The CHM 137 and CHM 141 males had the same correlation coefficient for the ACT mathematics/ACS final score relationship.

# Section IV:

# Summary and Interpretation of Study Results

## Section IV-A: The Purposes Restated

The purpose of this study is to determine if there is a gender difference in general chemistry success as a result of the Peer-Led Team Learning (PLTL) approach to instruction in general chemistry. A previous study[1] evaluated the effectiveness of the PLTL approach in CHM 137 both quantitatively in terms of success in chemistry and qualitatively based on the perception of CHM 137 students and PLTL peer leaders of gains attributed to the program.

This current study compared students by gender in the CHM 137 (PLTL class) and the CHM 141 (non-PLTL class) utilizing their mean scores on nine preparation and four success variables. There were some differences, although numerically small, in the entering preparatory scores. Overall, a high level of preparation was noted for all of these students.

The relationship between those entering preparation scores ad the two measures of college chemistry success most directly influenced by course instruction—chemistry class GPA and ACS standardized final exam was assessed. The statistical tool for this comparison was the correlation coefficient. Generally strong correlations were found for this series of relationships.

Confirming that a positive relationship existed between the measured variables, the next question was: do the outcomes follow general expectations of a direct relationship between the variables measured.

Comparing the preparation and success variables for the females vs. males within each class, it was found that the results were consistent with what would be expected. In general, those with higher incoming scores did, in fact, have higher success or outgoing scores on two of the four chemistry success measures. In both classes, the females had higher chemistry laboratory and fall semester GPAs while the males had higher chemistry class and ACS final exam scores.

Likewise, when comparing the preparation and success variables for the males of CHM 137 with the males of CHM 141, it was found that the results were also consistent with what would be expected. Those with higher incoming preparation scores in general had higher success or outgoing scores. The results were <u>not</u> consistent with expectations when comparing the female students in CHM 137 with the females students in CHM 141. It is this inconsistency that will be addressed in our interpretations.

## Section IV-B: Interpretations and Suggestions for Future Studies

Consider the following summary of the within gender comparisons for the female students in CHM 137 as compared with the female students in CHM 141:

CHM 137 FEMALES VS. CHM 141 FEMALES:

CHM 137 females: lower mean scores on all preparatory factors than CHM 141 females
CHM 137 females: higher correlation on all preparation factors with chemistry class GPA and on most preparation factors with ACS final exam than CHM 141 females
CHM 137 females: higher mean score on chemistry class GPA and on ACS final exam than CHM 141 females.

The CHM 137 females as a group had lower preparation values and a higher relationship between that preparation and the success variables, yet they did better (had higher scores) on both of the success variables. This was not consistent with expectations. Something made a difference for the CHM 137 female students.

Whether the PLTL approach of the CHM 137 class was a determining factor in the "better-than-expected" results of these females, we do not know, but something had a positive effect on the group. From the larger study of the PLTL program there is evidence of personal and emotional importance to the participants in the PLTL approach of CHM 137.

On the basis of the evidence from the two studies, the authors concur that the PLTL program was beneficial to the students. We suggest the following:

> (1) Conduct the same comparisons of future PLTL classes. Replication of studies is necessary to gain greater confidence that the successes reported herein are not situation specific
>
> (2) Conduct regression analyses evaluating the incremental value each of these preparation variables has individually and collectively on each of the dependent variable of chemistry success. The data which were the basis of these authors' two studies have not yet been exhausted. It could be used for these purposes.

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[1]Hoffelder, A.M. and R.L., "Evaluation of The Peer-Led Learning (PLTL) Approach to General Chemistry, CHM 137 for Fall Semester, 2002, Miami University, Oxford, Ohio" (2003).

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TABLE 1

ACADEMIC PREPARATION AND SUCCESS
BY
CHEMISTRY CLASS AND GENDER

| Measure | | CHM 137 | | CHM 141 | |
|---|---|---|---|---|---|
| | | Female | Male | Female | Male |
| M = Mean | | SD = Standard Deviation | | N = Number | |
| **High School Success** | | | | | |
| Grade Point Average | M | 3.70 | 3.45 | 3.76 | 3.70 |
| | SD | 0.35 | 0.37 | 0.38 | 0.39 |
| | N | 78 | 35 | 94 | 57 |
| Percentile Rank* | M | 15.75 | 34.28 | 14.81 | 18.26 |
| | SD | 12.52 | 20.06 | 11.40 | 13.97 |
| | N | 69 | 29 | 72 | 48 |
| **ACT Scores** | | | | | |
| Composite | M | 25.04 | 24.76 | 26.37 | 26.82 |
| | SD | 2.90 | 3.95 | 2.58 | 3.54 |
| | N | 73 | 29 | 75 | 44 |
| Science | M | 24.08 | 25.00 | 25.69 | 26.52 |
| | SD | 3.05 | 3.93 | 3.43 | 3.78 |
| | N | 73 | 29 | 75 | 44 |
| Mathematics | M | 24.79 | 24.52 | 26.56 | 27.75 |
| | SD | 3.73 | 4.24 | 2.80 | 4.22 |
| | N | 73 | 29 | 75 | 44 |
| Reading | M | 26.62 | 25.93 | 27.16 | 27.57 |
| | SD | 4.01 | 5.42 | 3.41 | 4.67 |
| | N | 73 | 29 | 75 | 44 |
| English | M | 25.12 | 23.48 | 26.75 | 26.05 |
| | SD | 4.07 | 4.94 | 3.12 | 4.16 |
| | N | 73 | 29 | 75 | 44 |

Table 1: Academic Preparation and Success By Chemistry Class and Gender, page 2

| Meassure | | CHM 137 | | CHM 141 | |
|---|---|---|---|---|---|
| | | Female | Male | Female | Male |
| **SAT Scores** | | | | | |
| Verbal | M | 557.06 | 601.54 | 591.80 | 594.52 |
| | SD | 70.41 | 62.97 | 57.58 | 60.17 |
| | N | 51 | 26 | 61 | 42 |
| Mathemtics | M | 565.29 | 618.46 | 603.44 | 629.76 |
| | SD | 62.46 | 55.55 | 62.05 | 81.43 |
| | N | 51 | 26 | 61 | 42 |
| **College Chemistry Success** | | | | | |
| College Class Grade Point Average | M | 2.42 | 2.44 | 2.29 | 2.45 |
| | SD | 0.98 | 1.19 | 0.97 | 1.02 |
| | N | 72 | 32 | 90 | 58 |
| Chemistry Laboratory Grade Point Average | M | 2.59 | 2.35 | 2.71 | 2.64 |
| | SD | 1.01 | 1.17 | 0.96 | 1.08 |
| | N | 76 | 31 | 91 | 59 |
| Fall Semester Grade Point Average | M | 2.84 | 2.45 | 2.91 | 2.70 |
| | SD | 0.68 | 1.07 | 0.60 | 0.90 |
| | N | 80 | 38 | 94 | 61 |
| American Chemical Society Final Examination | M | 47.94 | 49.00 | 45.52 | 51.26 |
| | SD | 8.04 | 10.94 | 8.23 | 9.09 |
| | N | 71 | 32 | 90 | 11 |

* High school class ranking's are usually given with the student with the highest GPA being considered the first percentile and the student with the lowest GPA being considered in the hundredth percntile. The is different from maanyother systems wich give the "better" item the hundredth or ninth-ninth percentile ranking.

TABLE 1-A

ACADEMIC PREPARATION AND SUCCESS BY
CHEMISTRY CLASS AND GENDER:

SYMBOLIC SUMMARY

| Measure | | CHM 137 Females | CHM 137 Males | CHM 141 Females | CHM 141 Males |
|---|---|---|---|---|---|
| HS GPA | | + | | + | |
| HS Percentile Rank | | + | | + | |
| ACT | Composite | + | | | + |
| | Science | | + | | + |
| | Mathemtics | + | | | + |
| | Reading | + | | | + |
| | English | + | | + | |
| SAT | Verbal | | + | | + |
| | Mathematics | | + | | + |
| College Class GPA | | | + | | + |
| Laboratory GPA | | + | | + | |
| Fall Semester GPA | | + | | + | |
| ACS Final Examination | | | + | | + |

(+) Notes the higher, more desireable level of attainment.

TABLE 1-B:

ACADEMIC PREPARATION AND SUCCESS BY
GENDER AND CHEMISTRY CLASS:
SYMBOLIC SUMMARY

| Academic Preparation Factor | | Females CHM 137 | Females CHM 141 | Males CHM 137 | Males CHM 141 |
|---|---|---|---|---|---|
| High School GPA | | | + | | + |
| High School %ile Rank | | | + | | + |
| ACT | Composite | | + | | + |
| | Science | | + | | + |
| | Mathematics | | + | | + |
| | Reading | | + | | + |
| | English | | + | | + |
| SAT | Verbal | | + | + | |
| | Mathematics | | + | | + |
| College Class GPA | | + | | | + |
| Chemistry Lab GPA | | | + | | + |
| Fall Semester GPA | | | + | | + |
| ACS Final Examination | | + | | | + |

(+) Notes the higher, more desireable level of attainment.

TABLE 2

CORRELTIONS OF ACADEMIC PREPARATION
WITH
FIRST SEMESTER CHEMISTRY CLASS SUCCESS
BY
CHEMISTRY CLASS AND GENDER

| Academic Preparation Factor | | CHM 137 Females | CHM 137 Males | CHM 141 Females | CHM 141 Males |
|---|---|---|---|---|---|
| r = Correlation Coefficient | | p = Probability | | n = Number of Students | |
| **High School Preparation** | | | | | |
| Grade Point Average | r | 0.43 | 0.35 | 0.33 | 0.28 |
| | p | 0.0002 | 0.0554 | 0.0016 | 0.0381 |
| | n | 72 | 31 | 90 | 55 |
| Percentile Rank | r | -0.43 | -0.42 | -0.39 | -0.16 |
| | p | 0.0006 | 0.0469 | 0.0009 | 0.2714 |
| | n | 62 | 23 | 69 | 47 |
| **ACT Scores** | | | | | |
| Composite | r | 0.57 | 0.40 | 0.28 | 0.56 |
| | p | <0.0001 | 0.0469 | 0.0172 | 0.0002 |
| | n | 67 | 25 | 72 | 41 |
| Science | r | 0.40 | 0.06 | 0.24 | 0.45 |
| | p | 0.0008 | 0.7647 | 0.0382 | 0.0031 |
| | n | 67 | 25 | 72 | 41 |
| Mathematics | r | 0.56 | 0.57 | 0.34 | 0.55 |
| | p | <0.0001 | 0.0029 | 0.0038 | 0.0002 |
| | n | 67 | 25 | 72 | 41 |
| Reading | r | 0.40 | 0.38 | 0.13 | 0.50 |
| | p | 0.0007 | 0.0581 | 0.2891 | 0.0008 |
| | n | 67 | 25 | 72 | 41 |
| English | r | 0.36 | 0.30 | 0.19 | 0.32 |
| | p | 0.0029 | 0.1507 | 0.1051 | 0.0439 |
| | n | 67 | 25 | 72 | 41 |

Table 2: Correlations of Academic Preparation with First Semester Chemistry Class Success by Chemistry Class and Gender Page 2

| Academic Preparation Factor | | CHM 137 Females | CHM 137 Males | CHM 141 Females | CHM 141 Males |
|---|---|---|---|---|---|
| SAT Scores | | | | | |
| Verbal | r | 0.24 | 0.12 | 0.21 | 0.31 |
| | p | 0.1153 | 0.5658 | 0.1031 | 0.0496 |
| | n | 46 | 24 | 60 | 41 |
| Mathematics | r | 0.47 | 0.44 | 0.36 | 0.43 |
| | p | 0.0009 | 0.0326 | 0.0051 | 0.0048 |
| | n | 46 | 24 | 60 | 41 |
| ACS Standardized Final Examination | | | | | |
| | r | 0.91 | 0.93 | 0.84 | 0.85 |
| | p | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| | n | 71 | 32 | 90 | 58 |

TABLE 2-A

CORRELATIONS OF ACADEMIC PREPARATION WITH
FIRST SEMESTER CHEMISTRY CLASS SUCCESS
BY CHEMISTRY CLASS AND GENDER:
SYMBOLIC SUMMARY

| Academic Preparation Factor | | CHM 137 Females | CHM 137 Males | CHM 141 Females | CHM 141 Males |
|---|---|---|---|---|---|
| High School GPA | | + | | + | |
| High School %ile Rank | | + | | + | |
| ACT | Composite | + | | | + |
| | Science | + | | | + |
| | Mathematics | | + | | + |
| | Reading | + | | | + |
| | English | + | | | + |
| SAT | Verbal | + | | | + |
| | Mathematics | + | | | + |
| ACS Standardized Final | | | + | | + |

(+) Notes the higher value in the comparison.

TABLE 2-B

CORRELATIONS OF ACADEMIC PREPARATION WITH
FIRST SEMESTER CHEMISTRY CLASS SUCCESS BY
GENDER AND CHEMISTRY CLASS:
SYMBOLIC SUMMARY

| AcademicPreparation Factor | | Females CHM 137 | Females CHM 141 | Males CHM 137 | Males CHM 141 |
|---|---|---|---|---|---|
| High School GPA | | + | | + | |
| High School %ile Rank | | + | | + | |
| ACT | Composite | + | | | + |
| | Science | + | | | + |
| | Mathematics | + | | + | |
| | Reading | + | | | + |
| | English | + | | | + |
| SAT | Verbal | + | | | + |
| | Mathematics | + | | | + |
| ACS Standardized Final | | + | | + | |

TABLE 3

CORRELATIONS OF ACADEMIC PREPARATION
WITH
ACS STANDARDIZED FINAL EXAMINATION TEST SCORES
BY
CHEMISTRY CLASS AND GENDER

| Academic Preparation Factor | | CHM 137 Females | CHM 137 Males | CHM 141 Females | CHM 141 Males |
|---|---|---|---|---|---|
| r = Correlation Coefficient | | p = Probability | | n = Number of Students | |
| **High School Preparation** | | | | | |
| Grade Point Average | r | 0.35 | 0.35 | 0.35 | 0.23 |
| | p | 0.0030 | 0.0525 | 0.0006 | 0.0974 |
| | n | 71 | 31 | 90 | 55 |
| Percentile Class Rank | r | -0.29 | -0.35 | -0.48 | -0.18 |
| | p | 0.0220 | 0.1024 | <0.0001 | 0.2238 |
| | n | 61 | 23 | 69 | 47 |
| **ACT Scores** | | | | | |
| Composite | r | 0.57 | 0.50 | 0.32 | 0.69 |
| | p | <0.0001 | 0.0103 | 0.0061 | <0.0001 |
| | n | 66 | 25 | 72 | 41 |
| Science | r | 0.40 | 0.22 | 0.31 | 0.60 |
| | p | 0.0009 | 0.2932 | 0.0078 | <0.0001 |
| | n | 66 | 25 | 72 | 41 |
| Mathematics | r | 0.52 | 0.62 | 0.37 | 0.62 |
| | p | <0.0001 | 0.0009 | 0.0013 | <0.0001 |
| | n | 66 | 25 | 72 | 41 |
| Reading | r | 0.40 | 0.49 | 0.13 | 0.56 |
| | p | 0.0008 | 0.0130 | 0.2903 | 0.0001 |
| | n | 66 | 25 | 72 | 41 |
| English | r | 0.40 | 0.35 | 0.21 | 0.43 |
| | p | 0.0008 | 0.850 | 0.0773 | 0.0056 |
| | n | 66 | 25 | 72 | 41 |

Table 3: Correlations of Academic Preparation with ACS Standardized Final Examination Scores by General Chemistry Class and Gender, Page 2

| Academic Preparation Factor | | CHM 137 Females | CHM 137 Males | CHM 141 Females | CHM 141 Males |
|---|---|---|---|---|---|
| r = Correlation Coefficent | | p = Probability | | n = Number of Students | |
| SAT Scores | | | | | |
| Verbal | r | 0.31 | 0.22 | 0.37 | 0.41 |
| | p | 0.0361 | 0.3050 | 0.0040 | 0.0074 |
| | n | 45 | 24 | 60 | 41 |
| Mathematics | r | 0.52 | 0.42 | 0.55 | 0.39 |
| | p | 0.0002 | 0.0398 | <0.0001 | 0.0123 |
| | n | 45 | 24 | 60 | 41 |
| Chemistry Class Grade Point Average | | | | | |
| | r | 0.91 | 0.93 | 0.84 | 0.85 |
| | p | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| | n | 71 | 32 | 90 | 58 |

TABLE 3-A

CORRELATIONS OF ACADEMIC PREPARATION WITH
ACS STANDARDIZED FINAL EXAMINATION SCORES
BY CHEMISTRY CLASS AND GENDER:
SYMBOLIC ANALYSIS

| Academic Preparation Factor | | CHM 137 Females | CHM 137 Males | CHM 141 Females | CHM 141 Males |
|---|---|---|---|---|---|
| High School GPA | | = | = | + | |
| High School Percentile Rank | | | + | + | |
| ACT | Composite | + | | | + |
| | Science | + | | | + |
| | Mathematics | | + | | + |
| | Reading | | + | | + |
| | English | + | | | + |
| SAT | Verbal | + | | | + |
| | Mathematics | + | | + | |

(=) means matched values on this measure.

TABLE 3-B

CORRELATIONS OF ACADEMIC PREPARATION WITH
ACS STANDARDIZED FINAL EXAMINATION SCORES
BY GENDER AND CHEMISTRY CLASS:
SYMBOLIC ANALYSIS

| Academic Preparation Factor | | Females CHM 137 | Females CHM 141 | Males CHM 137 | Males CHM 141 |
|---|---|---|---|---|---|
| High School GPA | | = | = | + | |
| High School Percentile Rank | | | + | + | |
| ACT | Composite | + | | | + |
| | Science | + | | | + |
| | Mathematics | + | | = | = |
| | Reading | + | | | + |
| | English | + | | | + |
| SAT | Verbal | | + | | + |
| | Mathematics | | + | + | |

(=) means matched values on this measure.