

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

ProQuest Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600

UMI[®]

NOTE TO USERS

Page(s) not included in the original manuscript and are unavailable from the author or university. The manuscript was microfilmed as received.

188

This reproduction is the best copy available.

UMI

UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

**THE FORMATION OF LEARNING GROUP MEMBERS'
PERCEPTIONS: AN EMPIRICAL STUDY OF THE NATURE
OF THE TASK**

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

In partial fulfillment of the requirements for the

Degree of

Doctor of Philosophy

By

**Mary H. McCord
Norman, Oklahoma
2001**

UMI Number: 3013154

Copyright 2001 by
McCord, Mary Helen

All rights reserved.

UMI[®]

UMI Microform 3013154

Copyright 2001 by Bell & Howell Information and Learning Company.

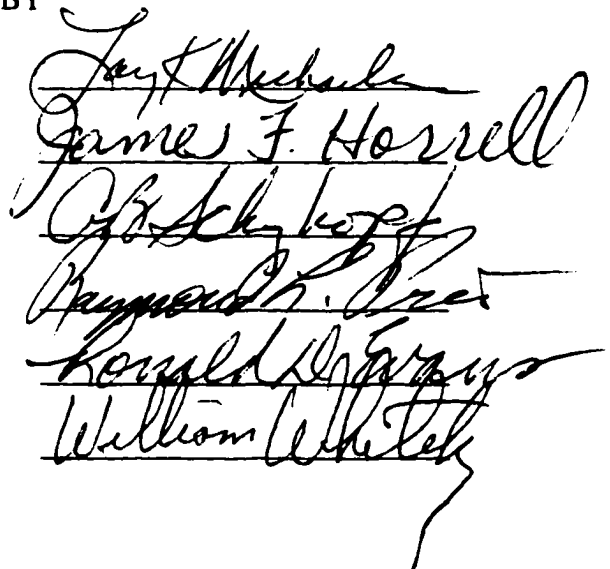
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

Bell & Howell Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

THE FORMATION OF LEARNING GROUP MEMBERS'
PERCEPTIONS: AN EMPIRICAL STUDY OF THE NATURE
OF THE TASK

A Dissertation APPROVED FOR THE
MICHAEL F. PRICE COLLEGE OF BUSINESS
(MANAGEMENT)

BY


Jay Michael
James F. Horrell
C. B. Schreyer
Raymond R. Price
Ronald Gray
William White

**© Copyright by Mary H. McCord 2001
All Rights Reserved**

Dedication

To my Family

Acknowledgements

Many thanks pour out of me at the end of the Ph.D. process. I thank God for giving me strength and encouragement when the task seemed impossible to accomplish. I also thank the many people he sent into my life that helped me.

My family has been a great source of support and solace. My father has told me since I was a child that I could do anything I was big enough to do. My parent's support did not stop at encouragement - they proofread each chapter. Rebecca mentored me through emotional turmoil and academic politics. All my family prayed.

Larry Michaelson accepted the difficult task as my dissertation chair and taught me to teach. What I know of service education, group learning, and motivating students came from absorbing as much as I could from his classroom and from continued mentoring. My committee members included Ronald Evans, James Horrell, R.L. Price, Al Schwarzkopf, and William Whitely. I thank them for their contributions to this dissertation. Other faculty provided important support and ethical oversight to the process. For their help, without which I may not have finished, I thank Daniel Wren and Eddie Smith.

A final word of thanks to the friends, fellow graduate students, and loves who generously listened, always understood, and lent a hand when I needed help. Kate Kimery, Alex Lee, Diane Baker, and my family - Henry Croes and April Ledbetter, who blessed me with the emotional and practical support I needed.

Acknowledgements	v
Abstract	xii
List of Tables	xiv
List of Illustrations	xviii
 CHAPTER ONE: THE FORMATION OF LEARNING GROUP MEMBERS' PERCEPTIONS: AN EMPIRICAL STUDY OF THE NATURE OF THE TASK	 1
Introduction	1
Change in Business Environment: Diverse Workforce	1
Change in Business Environment: Use of Teams	2
Change in Learning Environment: Diverse Student Body	2
Change in Learning Environment: Use of Teams	4
Potential Positive Impact of Learning Groups	4
Potential Positive Impact of Learning Groups on Attitudes	5
Potential Negative Impact of Group Work	6
Potential Negative Impact of Groups on Student Attitudes	6
Implications beyond the immediate situation	8
What Makes the Difference?	9
Research Questions	11
Outline of the Dissertation	11
 CHAPTER TWO: LITERATURE REVIEW	 13
Theories Relevant to Member's Perceptions: Terms and Definitions	13
Groups - increasing use in business and education	13
Heterogeneity - a critical component in groups	14
Attribution Theory	15
Concepts necessary to form attributions	16

Impact of Member's Personal Attributes	21
Personal Attributions of Diversity	22
Underlying Attributions of Diversity – Task Competency	33
Summary of Diversity Literature	35
Nature of the Task	38
The Influence of Task	38
Task Characteristics: Wood's Typology	40
Determining Task's Level of Interaction	42
Tasks: Interdependent vs. Independent	44
Differences in Group Outcomes	49
Summary of Literature	50
Conclusions and Implications for Research	51
 CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY	 53
Primary Research Questions	53
Conceptual Model of Study	54
Survey Method and Design:	56
Subject Selection and Survey Domain	57
Procedures for Data Collection	57
Instrument Development:	58
Instrument Development: Personal Traits	59
Instrument Development: Task Competency	63
Reducing Bias and Threats to Validity	65
Method of Measurement	68
Personal Diversity: Method of Measurement	69
Underlying Task-Related Contributions: Method of Measurement	70
Mediating Variable –Task Interdependence: Method of Measurement	70
Dependent Variables: Reliability of the Measures	71
Statistical Procedures	72
Summary	73
Analysis: Statistical Tests using dummy variables	73
Surface Traits measured as dummy variables	74
Task Competencies measured as quantitative variables	78
Measuring the Interactivity of the Task	78
Model for Testing Null Hypothesis 1	80
Model for Testing Null Hypothesis 2	81
 CHAPTER FOUR: STATISTICAL ANALYSIS	 82

Introduction:	82
Sample Characteristics	82
Student Characteristics	83
Institutional Data	90
Level of Analysis	91
Missing Data	92
Constructs: Type of Variables and Value range	93
Personal Traits Measured as quantitative D_scores	94
Task contribution measured as a quantitative variable	96
Tests of Collinearity	97
Measuring the Interdependence of the Task	98
Reliability of Measures	99
Group Learning Effectiveness	99
Measure of Task Interactivity	100
Measure of Member Performance	102
Summary	103
Statistical Models for testing hypotheses	104
The Development of Perceptions of Learning Effectiveness	105
Use of Control Variables	106
Task Effects on Perceptions of Learning Effectiveness	110
Relationship between Personal Differences and Perceptions of Learning Effectiveness when Task is Interdependent	113
Relationship between Member's Task Competencies and Perceptions of Learning Effectiveness when Task is Interdependent	116
Relationship between Member's Demographic Diversity and Perceptions of Learning Effectiveness when Task is Independent	118
Relationship between a Member's Task contributions and Perceptions of Learning Effectiveness when Task is Independent	120
Summary of Development of Perceptions of Learning Effectiveness	127
The Development of Perceptions of Member Performance	130
Task Effects on Perceptions of Another Member's Performance	132
Relationship of Task Contributions and Member Performance	141
Relationship between Personal Differences and Perceptions of Another Member's Performance when Task is Interdependent	142
Relationship between Personal Differences and Perceptions of Another Member's Performance when Task is Independent	143
Relationship between Task Contributions and Perceptions of Another Member's Performance when Task is Interdependent	144
Relationship between Task abilities and Perceptions of Another Member's Performance when Task is Independent	148

Relationship between All Variables Using an Interdependent Task and Perceptions of Another Member's Performance	150
Relationship between All Variables Using an Independent Task and Perceptions of Another Member's Performance	151
Summary of Development of Perceptions of Another Member's Performance	152
Relationship between Best overall member and the Worst overall member	153
Relationship Between Type of Report and Task Type for members that self-report themselves as the best overall performer	153
Frequency counts of task capability when member was rated as "best overall" and "worst overall"	154
CHAPTER FIVE: DISCUSSION OF THE RESULTS	157
Introduction	157
Terms and Definitions	157
The Perception of Group Learning Effectiveness	159
Interdependent tasks lead to positive perceptions of group learning	160
Effects of diversity on perceptions of group learning	162
Personal Diversity in interdependent groups has mixed impact on learning effectiveness	163
Personal Diversity in Independent groups has little impact on learning effectiveness	164
Summary of personal diversity's impact for both types of task	164
Task competency in interdependent groups has little impact on learning effectiveness	164
Task competency in independent groups has mixed impact on learning effectiveness	165
Background on task type's impact on perceptions of group learning	165
Conclusions about Task type's impact on learning perceptions	168
Implications of the Findings	171
Task diversity: classroom solutions	171
Personal diversity: classroom solutions	171
Task type's impact on perceptions of other member's performance	173
Task competencies have strong impact on perceptions of other members	173
Despite the task, personal traits have no impact on another member's perceived performance	175

Despite the task, differences in task competency lead to positive perceptions of another member's performance	176
Differences in Task competency have more impact than personal diversity on Perceptions of Another Member's Performance when using Interdependent Tasks	176
Differences in Task competencies have more impact than personal diversity on Perceptions of Another Member's Performance when using Interdependent Tasks	177
Summary of task competency's impact on member performance	178
Members more likely to self-report themselves as "best" when using interactive tasks	179
Summary of Development of Perceptions of Another Member's Performance	179
Implications of findings concerning member perception	180
Issues of Measurement	181
Limitations of the study	186
Further Study for factors in group learning effectiveness	186
Further Study for factors of perceptions of other's performance	187
Conclusion	188
BIBLIOGRAPHY	191
Other Readings:	202
Appendix A: Instruments	207
Surveys	207
Survey Questions with Variable Names	210
Appendix B: Determine Task Competencies for Group Members	215
Appendix C: Summary of Statistical Tests and Proxies	216
Appendix D: Tests of Heteroskedasticity	218
Tables for Appendix D	224
Appendix E: Tests of Multicollinearity	237
Canonical Correlation	240
Collinearity Diagnosis	241
Appendix F: Discriminant Analysis	244
Summary	247
Appendix G: Frequencies of task type and overall performance	249
Appendix H: Confidence Intervals for Null Hypothesis Two	251

Appendix I: Assignment Characteristics	252
Frequency and Correlation of Types of Assignments	252
Appendix J: Analysis of Assumptions for Null Hypothesis Two	255
Appendix K: Frequency tables of task capability when member was rated as “best overall” and “worst overall”	256

Abstract

The purpose of this study was to empirically examine: 1) the mediating impact of the type of tasks used for group learning and 2) how the type of task affects students' attitudes towards learning in diverse groups. In addition, this study examined the relationships between members' attributes (personal traits and task competencies) and the type of task to perceived learning experience in groups or to perceived performance of other group members. Models of the relationship of member attributes and task type to 1) perceived learning effectiveness and 2) perceptions of other members' performance were proposed.

Data for the study were obtained from 822 undergraduate business students at 8 US and 2 Canadian universities. Subjects were randomly assigned to complete one of two surveys during the first class period of the final semester of their senior year. The surveys asked students to report on either their most positive or least positive group experience from a previous class.

Type of task was categorized as 'independent' and 'interdependent' based on hours spent working alone vs. face-to-face. Results overwhelming supported the superiority of interdependent tasks as compared to independent tasks for group learning. Even when students reported on their least positive group experience, interdependent tasks were associated with perceptions of increased learning effectiveness.

Results also indicated that: 1) most personal traits (class standing, ethnicity, age and gender) impacted perceived learning effectiveness only when students reported on their least positive group experience and, 2) students who were a racial minority within their group preferred to work alone no matter what type of group task.

The relationships between members' personal traits or task competencies and perceptions of their performance showed no impact from the member's personal traits. No matter which type of task or type of group experience, a member's task competencies positively influenced perceptions of a their overall performance. A member's dependability impacted their perceived overall performance much more than other task related traits. A member's knowledge skills also strongly impacted perceptions of their performance.

List of Tables

Table 4.1: Gender of Subjects

Table 4.2: Age of Subjects

Table 4.3: Race of Subjects

Table 4.4: Ethnicity of Subjects

Table 4.5: English Fluency of Subjects

Table 4.6: Major of Subjects

Table 4.7: Class of Subjects

Table 4.8: Summary of Correlation Analysis

Table 4.9: Response Rates by Institution

Table 4.10: Independent Variables: Descriptive Statistics

Table 4.11: Reliability of Multi-Item Group Learning Effectiveness Measure

Table 4.12: Reliability of Multi-Item Task Interactivity Measure

Table 4.13: Null Hypothesis 1: Regression of task and controls on learning effectiveness

Table 4.14: Summary of Stepwise Selection: Regression of Task and Controls on Learning Effectiveness

Table 4.15: T-Test Analysis: Report Type and Learning Effectiveness

Table 4.16: T-Test Analysis: Differences in Learning Effectiveness compared by Task Type

Table 4.17: T-Test Analysis: Difference in Learning Effectiveness -Task Type by Report Type

Table 4.18: Relationship between Member's Personal Differences and Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Stepwise Selection

Table 4.19: Relationship between Member's Personal Differences and Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Analysis of Variance

Table 4.20: Relationship of Member's Task competency and Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Stepwise Procedure

- Table 4.21: Relationship between a Member's Task differences and Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Analysis of Variance
- Table 4.22: Relationship between Member's Personal Differences on Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Stepwise Procedure
- Table 4.23: Relationship between Member's Personal Differences on Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Analysis of Variance.
- Table 4.24: Relationship between a Member's Task Contributions and Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Stepwise Procedure
- Table 4.25: Relationship between a Member's Task Contributions and Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Analysis of Variance
- Table 4.26: Relationship between All Variables on Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Stepwise Procedure
- Table 4.27: Relationship between All variables and Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Analysis of Variance
- Table 4.28: Relationship between All Variables and Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Stepwise Procedure
- Table 4.29: Relationship between All Variables and Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Analysis of Variance
- Table 4.30: Regression of task and controls on member performance
- Table 4.31: Relationship of Controls on Perceptions of Member Performance: Summary of Stepwise Procedure
- Table 4.32: Regression of Task and Report Type on Member Performance
- Table 4.33: T-test of Report Type and Hours Face-to-Face
- Table 4.34: T-test of Report Type and Member performance scores
- Table 4.35: Frequency of performance scores by report type
- Table 4.36: T-Test: Report Type and Task Type

Table 4.37: Relationship between Personal Differences and Perceptions of Another Member's Performance when using Interdependent Tasks: Residual Chi-Square Test

Table 4.38: Relationship between Personal Diversity and Perceptions of Another Member's Performance when using Independent Tasks: Residual Chi-Square Test

Table 4.39: Relationship between Task Diversity on Perceptions of Another Member's Performance when using Interdependent Tasks: Summary of Logistic Regression

Table 4.40: Amount of Variance explained by Task Diversity on Perceptions of Another Member's Performance when using Interdependent Tasks: R-Square

Table 4.41: Relationship of Task Abilities and Perceptions of Another Member's Performance when using Independent Tasks: Summary of Logistic Regression

Table 4.42: Amount of Variance explained by Task Abilities and Perceptions of Another Member's Performance when using Independent Tasks: R-Square Test

Table 4.43: T-Test Analysis: Report Type and Task Interactivity

Table 4.44: T-Test Analysis: Difference in Face-to-face interaction hours -Task Type by Report Type

Table D.1: Differences Among Institutions on Respondent's Personal Traits

Table D.2: Differences Among Institutions on Control Variables

Table D.3: Cross-Tabulation of Institution and Race

Table D.4: Cross-Tabulation of Institution and Ethnicity

Table D.5: Cross-Tabulation of Institution and Class System

Table D.6: Cross-Tabulation of Institution and Number of Groups per Semester

Table D.7: Cross-Tabulation of Institution And Group Tenure

Table D.8: Cross Tabulation of Gender by completed surveys

Table D.9: Missing Data and Attrition Rate

Table D.10: Regression Model for Ttl hrs (Task Interactivity) and Control Variables

Table E.1: Correlation Coefficients Among Personal Trait D-Scores

Table E.2: Correlation Coefficients Among Task Trait Values

Table E.3: Correlations Between Distance Scores of Personal and Task Variables

Table E.4: Canonical Correlation Analysis of Personal D-scores to Task Values

Table E.5: Collinearity Diagnostics on D Scores: Eigenvalues and Condition Indices

Table E.6: Variance Inflation Factors

Table F.1: Discriminant Analysis of Learning Measure Regressed on Observer's Personal Traits

Table F.2: Discriminant Analysis of Learning Measure Regressed on Type of Task

Table F.3: Discriminant Analysis of Report Type Regressed on Type of Task

Table I.1: Frequency of Task Types according to Survey Type

Table I.2: Correlation Table for Task Types

Table J.1: T-Test Analysis: Task Type and Member Performance

List of Illustrations

Figure 3.1: The importance of the nature of the task to member's perceptions and learning experience

Figure 4.2: Test of task and controls on Learning Effectiveness: Maximum regression with standardized parameter estimates

Figure 4.3: Plot of Residuals of control variables and Task variable on overall Performance

Figure 4.4. Line Chart of frequency of task capabilities perceived as high for member voted best overall

Figure 4.5. Line Chart of frequency of task capabilities perceived as low for member voted worst overall

Figure 5.1: The importance of the nature of the task to member's perceptions of learning experience

Figure 5.2: The importance of the nature of the task to member's perceptions of other members' performance

Figure G.1: Frequency of Performance Scores in Least and Most Positive Populations

Chapter One: The Formation of Learning Group Members'

Perceptions: An empirical study of the nature of the task

Introduction

This study is concerned with changes in the instructional practice of business schools that have evolved in response to two trends in the business environment. The first business environment change is the growing diversity of the U.S. workforce, and the second is the increased use of teams as a means of coping with a highly competitive business environment.

Change in Business Environment: Diverse Workforce

By the year 2050, the U.S. Census Bureau predicts whites will be a minority, and present-day minorities will be in the majority (Chideya, 1999). For business, the growth of cultural diversity in the workforce has been a major concern (Jackson, Stone, & Alvarez, 1993; Kirchmeyer, 1993). Many reports, including Workforce 2000 (Johnston & Packer, 1987) and Workforce 2020 (Judy & D'Amico, 1997) have outlined the trend toward increased workforce diversity and its implications for organizational functioning. United States corporations have changed business practices due to trends in legislation and in labor market demographics that are increasing the desirability and availability of diverse employees.

Legislative changes such as Affirmative Action programs of the 1960's and 1970's have partially succeeded in correcting discrimination towards women and ethnic minorities. Labor supply trends are also driving an increase in heterogeneity in the work force. These trends include fewer qualified employees, entry of women and

immigrants, business globalization, and an aging population (Jackson, et al., 1993). To capitalize on these internal forces and to compete internationally, businesses are using organizational designs that rely on diverse work teams as a basic building block.

Change in Business Environment: Use of Teams

Over the last two decades, a number of forces have pushed organizations to redesign jobs in ways that increase task interdependence and group work. These changes apply to nonprofessional jobs like assembly line work as well as to professional jobs. One motivation to use teams was the emulation of Japanese competition, who used quality circles (inter-functional groups) as part of Deming's Total Quality Management strategy (1986). Presently, teams that cross over functional and departmental boundaries are believed to have strategic competitive value by facilitating production quality (Banas, 1988), increasing innovation (Kanter, 1988, 1989), and developing new products that will be acceptable to customers and easy to produce (Dumaine, 1990).

Change in Learning Environment: Diverse Student Body

Like business, institutions of higher education have responded to legal and demographic pressures for a more diverse student body. A case in point, the University of Oklahoma began to proactively pursue diversity through scholarships in the late 1980's, and in 1990 it was one of the first institutions in the nation to have a minority recruitment office. From 1978 to 1998, minority representation at the University of Oklahoma has more than doubled -- from 14% to 29%, while overall student enrollment has only grown 3%.

Most state institutions desire a student population that reflects the demographic make-up of their state. The present 15-22 year old student set, dubbed the Millenium Generation, is the most racially mixed generation America has ever had. Its members are 60% more likely to be nonwhite than those of its parents' and grandparents' generations, and a third are Black, Latino, Asian or Native American (Chideya, 1999). Correspondingly, the last twenty-five years has seen many more minority students enrolled and graduated. For instance over the past three decades the nation's 25 top business schools have produced about 10,000 black MBA graduates (Cross & Slater, 1998).

Business educators can expect an increase in student diversity for the future. As it is in the interests of corporate America to *recruit* minority business students, it is also in the interests of American business schools to *admit* qualified minorities. Dalton et. al. (1998) summarizes this view,

"..many of our corporate friends would not recruit at our school at all if we did not provide them with the diversity of student body they expect and demand. It is clear to us that our attention to diversity provides additional employment opportunities for all of our students...."

Virtually all colleges are eager to improve racial diversity (Reisberg, 1998) for reasons beyond those of Affirmative Action. Many administrators feel that a diverse population creates a better and more interesting atmosphere for learning (Franks, 1998). In addition, as the U.S. population has become more diverse, the student body has naturally increased in demographic variance.

Change in Learning Environment: Use of Teams

Traditionally a business degree's curriculum focused on a content area, such as marketing, accounting, or computing. Yet, when corporations were asked to rank which traits were most important for new hires, recruiting managers ranked "appropriate leadership/interpersonal skills" first, "motivation" second, and "content area knowledge" last (Porter & McKibben, 1988). In response to these demands, higher education business instructors increasingly try to simulate the real business team environment by assigning groups to complete challenging, experiential exercises. In fact, some institutions have created a curriculum based entirely on the development of managerial skills such as communication, teamwork, and maturity. (Boyatzis, 1994; Boyatzis, Cowen & Kolb, 1991; Whetten, Windes, May & Bookstaver, 1991).

One way this pedagogical shift can be seen is by the changes in classroom layout, equipment, and even furniture that have occurred at the University of Oklahoma's Business school. Until twenty-five years ago all the chairs in Adams Hall were bolted. There was some variation -- in the way they were bolted. Chairs were bolted together side by side, creating rows six chairs wide facing the front of the classroom. The alternative was bolting each individual chair to the floor -- again, facing the front. Today, most of the rooms in Adams Hall are equipped with furniture that accommodates "clusters". They have tables that can form octagons or rows, movable chairs, or movable chairs with desk-arms.

Potential Positive Impact of Learning Groups

The potential advantages and student benefits of learning by interacting in groups has been well researched and documented. Using projects that simulate real-

world business experiences, students work together to accomplish shared learning goals (Johnson, Johnson, and Smith, 1998). Well designed group work can result in greater mastery and retention of subject matter, as well as the ability to generalize to other situations (Johnson & Johnson, 1989). Some researchers have found that the quality of problem solving increases (Arnes & Murray, 1982), as does creativity (Johnson & Johnson, 1989; Watson, Kumar, and Michaelson, 1993). Other positive benefits of small group instruction can be higher learning level and problem solving skills (Kurfiss, 1988), and enhanced effectiveness of computer-based instruction (Wojtkowski & Wojtkowski, 1987). Another possible positive side effect of the learning experience is that group work and the higher involvement it encourages can lead to lower drop out rates for accounting students (Wilson, 1982) and science majors (Tobias, 1990) as well as in general (Johnson, 1997; Gandara, 1995).

Potential Positive Impact of Learning Groups on Attitudes

The potential positive impact of group work is not limited to increased learning. Many researchers found that exposure to different backgrounds, opinions, and expertise could create more positive attitudes towards peers and working in a group setting (Sharan, 1980). Of particular interest to potential employers, interactions in diverse student groups have been shown to reduce the negative stereotypes toward minorities. For instance, many researchers have found that groups can lead to increased cross-racial relationships (DeVries, Edwards, & Wells, 1974; Weigel, Wiser, & Cook, 1975) and eliminate the basis for stereotypes based on race, gender and physical handicaps (Johnson, Johnson & Maruyama, 1983). This interaction can also lead to greater exchange of diverse information and expertise (Johnson, Johnson, Johnson, &

Anderson, 1976; Johnson, Johnson & Scott, 1978) and enhanced member sociability and attraction (Johnson, et al., 1978). Groups can increase helping behaviors towards others (Johnson, et al., 1976; Lazarowitz, Sjaram, & Steinberg, 1980) and can strengthen interpersonal skills (Johnson & Johnson, 1989). Properly designed and managed group activities can also produce positive attitude changes for the members towards themselves, as well. Confirmed repeatedly in student studies of various age, race, and socio-economic levels, the Johnsons' studies found that group learning may give members more feelings of stimulation, enjoyment, trust, and increased self-esteem (Johnson & Johnson, 1989).

Potential Negative Impact of Group Work

Although a growing number of business faculty have come to believe that group work can lead to both increased learning and positive attitudes towards working in diverse groups, other faculty are adamantly convinced that just the opposite is true. Their view, often based on personal experience, is that students learn less because they are likely to adopt one of two counterproductive strategies to complete group assignments. One is that a subset of the group actually does most of the work. The other is that students divide up the work and assign the components to the member who is already the most "expert" in that specific area.

Potential Negative Impact of Groups on Student Attitudes

When groups do encounter problems, the outcomes are just the opposite of what would be predicted by the empirical studies that have found that group work is likely to increase interaction and interpersonal attraction (DeVries, Edwards, & Wells, 1974,

Weigel, Wiser, & Cook, 1975; Johnson, et al., 1983, Johnson, et al., 1978; Johnson, et al., 1989). Instead, faculty members are troubled by two additional problems. One is the fact that students often maintain that they have had to do more than their fair share of the work. The other is that students' perceptions of inequitable treatment usually trigger an angry set of claims and counter-claims. On one side, the students who have given low ratings maintain that their evaluation was based on factors such as poor attendance, bad attitudes and/or a lack of contribution with respect to the satisfactory completion of the group's assigned tasks. On the other side, the low-rated student(s) almost always maintain that they were excluded or disliked because of some sort of personal attribute. When this happens, everyone loses. Faculty members face the difficult task of sorting out who is at fault and developing a response that is both fair and defensible. For the students, the unintended learning can be that group work is both risky and potentially painful.

Unfortunately, problems of this type may be on the rise because of both the increased use of group work and the greater diversity of the student population. For example, in the past few years at the University of Oklahoma, numerous faculty members have expressed concern with academic appeals and student complaints related to group work. Anecdotally, the perception seems to be that minority students receive a disproportionate amount of low peer evaluations. Faculty have expressed that an increasing number of the appeals are being brought by minority students who argue that their low peer evaluations were prompted by prejudice on the part of their peers (most commonly based on race, gender and/or age differences). In many of these cases, developing a response that is both fair and defensible is even more difficult than in

Weigel, Wiser, & Cook, 1975; Johnson, et al., 1983, Johnson, et al., 1978; Johnson, et al., 1989). Instead, faculty members are troubled by two additional problems. One is the fact that students often maintain that they have had to do more than their fair share of the work. The other is that students' perceptions of inequitable treatment usually trigger an angry set of claims and counter-claims. On one side, the students who have given low ratings maintain that their evaluation was based on factors such as poor attendance, bad attitudes and/or a lack of contribution with respect to the satisfactory completion of the group's assigned tasks. On the other side, the low-rated student(s) almost always maintain that they were excluded or disliked because of some sort of personal attribute. When this happens, everyone loses. Faculty members face the difficult task of sorting out who is at fault and developing a response that is both fair and defensible. For the students, the unintended learning can be that group work is both risky and potentially painful.

Unfortunately, problems of this type may be on the rise because of both the increased use of group work and the greater diversity of the student population. For example, in the past few years at the University of Oklahoma, numerous faculty members have expressed concern with academic appeals and student complaints related to group work. Anecdotally, the perception seems to be that minority students receive a disproportionate amount of low peer evaluations. Faculty have expressed that an increasing number of the appeals are being brought by minority students who argue that their low peer evaluations were prompted by prejudice on the part of their peers (most commonly based on race, gender and/or age differences). In many of these cases, developing a response that is both fair and defensible is even more difficult than in

homogeneous groups. This is because the minority student(s) often respond to the claim that they failed to contribute with the counter-claim that they were willing to do more, but their peers never gave them the chance to do it. Thus, in addition to determining who actually did what, resolving disputes that occur in diverse learning groups also requires faculty to assess the extent to which the minority students' purported lack of contribution resulted from a stereotype-based, self-fulfilling, prophecy. Further, the negative outcome of the group work in these cases seems to create and/or reinforce an additional type of negative attitude. Based on their after-the-fact comments, not only are the students increasingly wary of group work, but often the accusers on both sides see the experience as one more reason to mistrust and/or avoid working with others who are "different" in some visible way.

Implications beyond the immediate situation

The greater the extent to which the higher education environment of business schools mirrors the real business world, the more likely it is that those students will carry their abilities and attitudes from group work directly into their future jobs. This can be a two-edged sword. Positive experiences give the student group interpersonal skills highly sought after by corporate recruiters. On the other hand, while knowledge and abilities mastered in business education are more easily transferred to the student's job, poor attitudes are also directly transferable. Poor group experiences, which predispose the student to dislike group work and be wary of peers who are different, are a serious educational failure and a disservice to their future career success.

What Makes the Difference?

This study is intended to resolve some of the disparity between the literature advocating group-based instruction and experience-based faculty misgivings about using learning groups. Most previous empirical work has focused on whether or not group work is likely to produce positive outcomes. By contrast, the current study is intended to provide some practical insights as to why group work sometimes produces learning gains and positive attitudes and, in other cases, has just the opposite effect.

Unfortunately, much of the mainstream literature from advocates of group-based instruction is of little help for post-secondary educators for two reasons. One problem is that most of their thinking has been focused on elementary school settings. Thus, their prescriptions assume two key conditions that rarely exist in colleges and universities. These are: 1) classes with a maximum of 25-30 students, and 2) classes meet for 30+ hours each week. The other problem with the literature advocating group-based instruction is that most writers tend to provide almost too much guidance. For example Johnson and Johnson, who are probably the most prolific advocates of “Cooperative Learning” (the most common term used by advocates of learning groups) argue that 5 “essential components” must be included if group work is to be successful (1994). While the idea is well intended, their principles (2 of which will be discussed in detail in chapter 2) are so broad that they amount to a laundry list of possibilities. As a result, they provide limited guidance as to what is really important.

Two different streams of inquiry, both of which have focused on college-level instruction, have heavily influenced the current study. One is an empirical investigation by Feichtner and Davis (1985). The other is a series of conceptual articles by Watson,

Kumar and Michaelsen (1993). The strength of the study by Feichtner and Davis (1985) is that it directly examines some of the differences related to students' positive and negative experience in learning groups in business school settings, providing clear empirical support that one of the key variables in determining the effectiveness of group work is the nature of the group assignments. For example, students' best group experiences most often occurred in classes in which they took several group tests. In contrast, class presentations or research projects resulted in more reports of a negative group experience. Interestingly, although an emphasis on written reports was most likely to increase reports of a negative group experience it was assigned in 94% of all groups surveyed (Feichtner & Davis, 1985).

Michaelsen and his colleagues go much further in their claims with respect to the importance of the nature of the tasks required by group assignments. Although they offer only anecdotal evidence to support their contentions, Michaelsen, Fink & Knight (1997) argue that the single most important variable in determining the impact of group work is whether or not tasks stimulate intensive, give-and-take group interaction. Further, they maintain, again with only anecdotal evidence to support their contentions, that with well designed group assignments, 1) long-term learning is likely to be increased, but is profoundly impacted by the specific requirements of the group learning tasks, 2) members are inclined to be highly motivated towards investing personal energy doing group work, 3) members are likely to interact in ways that promote cohesiveness of their group, 4) naturally quiet members are much more likely to engage in intense discussion, and 5) groups are likely to develop a norm of broad-based participation.

Research Questions

The purpose of this study is to build on the work of Feichtner and Davis and empirically examine the validity of the claims made by Michaelsen and his colleagues with respect to: 1) the importance of the tasks that are involved in the completion of group assignments and 2) how, if at all, the nature of learning group tasks affect students attitudes towards working in the kind of diverse groups that are becoming more and more common in both educational and work settings. Specifically, the research will focus on the following questions:

1. Does the type of task have an impact on perceived learning effectiveness?
2. Does the type of task have an impact on member perceptions of each other?

Outline of the Dissertation

This paper is organized into five chapters. Chapter One presented a broad overview of the problem to be studied. Chapter Two presents a comprehensive review of the literature related to small groups and group tasks and includes the definitions of terms. Chapter Two also integrates the theoretical frameworks of attribution, diversity, social categorization and social perception.

Chapter Three introduces the conceptual model and the research methodology used in this study, and presents a survey instrument that will be measuring the respondent and their group members' descriptive characteristics and task competency. Chapter Three concludes with the study's hypotheses and a description of the data collection procedures and data analysis strategies.

Chapter Four presents findings related to the research questions about group diversity, the nature of the task, and attributions. From these findings a framework is developed to evaluate group tasks and the context in which they are used.

Chapter Five summarizes the key findings concerning the overall results of the study. This chapter also addresses the limitations of the study within the context of making recommendations for future inquiry into the issues of learning groups and diverse groups.

Chapter Two: Literature Review

Theories Relevant to Member's Perceptions: Terms and Definitions

This study will examine the relationships between members' attributes, the task (group assignments), perceived learning experience and perceived performance of members in learning groups. This review of the literature will attempt to synthesize attribution theory with concepts of diversity, perception, and categorization, and relate these concepts to evaluations of member performance and learning experience. Decades of previous demographic research has either focused on *how* an individual's traits relate to their evaluations by superiors, subordinates or peers, or *how* group heterogeneity (demographically measured) relates to group outcomes. This research will explore *why* personal diversity relates to group outcomes, and will extend the previous body of literature by including the mediating influence of the task on evaluations of diverse members and learning experience.

Groups - increasing use in business and education

The use of groups is expected to increase in the future. Forces such as globalization combined with technological tools like E-mail, Lotus Notes, and Group Decision Support Systems are expected to increase the use of virtual teams (Saunders, 2000; Horvath & Tobin, 1999). In addition, competition and costs are driving the team orientation through flattened business hierarchies. Downsizing and rightsizing have led to more group-oriented organizational structures (Hoerr, 1989). This is illustrated by an international survey of nearly 3,000 managers that indicated a growing interest in teamwork (Towers Perrin, 1991).

For these reasons, using groups in education better simulates real world experience. Additionally, American business is interested in hiring business school graduates that have group skills and experience (Michaelson, 1999). Students that have already learned group skills through experiential projects will have an advantage over those trained individually through lecture.

Heterogeneity - a critical component in groups

Inasmuch as educators want to give their students realistic expectations and business training, the use of heterogeneous groups is an increasingly important issue to business education. Instructors pursuing realistic learning situations try to mirror the U.S. workforce's composition, which is increasingly diversified due to several changes. Some of these are: 1) the demographic changes in the U.S. work force, 2) large population increases in poor countries, 3) increased ethnic interpenetration due to rising social and global mobility, and 4) globalization made possible through advanced technology. At the least business practitioners recognize this increase in heterogeneity as an inevitable state of the modern workforce. Management educators pursuing experiential teaching methods must also include heterogeneity as a critical component of preparing students for 'real' group experiences. The skill of tolerance cannot be practiced by students in lecture based instruction. Increasing diversity impacts higher management education research, as well as pedagogy. Group dynamic theorists and researchers must be prepared to address the rising heterogeneity of group composition characterized by variables such as race and culture (demographic attributes), values (personal attributes), and customs (social attributes).

Past research used several different types of groups to examine issues such as group composition, process, and performance. For this review, “group” is loosely defined to include business units, small groups, committees, boards, etc. In addition, the meaning of terms such as “diversity”, “heterogeneity” and “task” have varied from study to study. This literature review will therefore survey how researchers have operationalized these terms and will define these variables for this study.

Attribution Theory

Attribution theory is concerned with the cognitive processes by which an individual interprets other people’s behavior as being caused by (attributed to) certain parts of the relevant environment (Kelley, 1967, 1973). It is concerned with the “why” of motivation and behavior. Since most of the “why”s of other’s behaviors are not directly observable, people must depend upon their own cognition, or perception, to attribute motivation to observable behavior. Therefore, attribution theory bridges the relationship between personal perception and interpersonal behavior (Luthans, 1995, p. 162). Accordingly, the attribution(s) members make about others or the learning environment is expected to influence group processes and outcomes.

All attribution theories share three common assumptions: 1) we seek to make sense of our world, 2) we often attribute people’s actions either to internal or external causes, and 3) we do so in fairly logical ways (Myers, 1990). Fritz Heider (1946), the theory’s initiator, stressed that it was the perceived, not actual, determinants that are important to behavior. For example, people evaluate others differently if they perceive another’s behavior as being due to internal attributes (honesty, hard work) than if they perceive external attributes (legislation, luck). In this study, perceived external

attributes are measured through demographic traits, or personal attributes, while internal attributes are measured through underlying task competency and ability. An explanation of these categories will follow later in this review.

Attribution Accuracy

The theory of attribution deals with the gap between objective measures of reality and other's perceptions of reality. As Heider (1946) pointed out, attribution (and this study) is only interested in perception, and so limited its measures to perceptions of traits, behaviors and the learning environment. Yet, this review would be incomplete if it did not examine some of the concepts that explain the size of the gap between accurate observations and perceptions.

Recent studies have examined two biases that affect people when they make attributions. The first is fundamental attribution error, where people tend to ignore powerful situational forces when explaining other's behavior. People tend to attribute other's behavior to internal factors (intelligence, ability, motivation, etc) even when it is clear external forces caused their behavior (Myers, 1990). The second major error is self-serving bias, where people attribute their own success to internal factors (ability and effort) but attribute their failure to external factors in the situation (bad luck, task difficulty)(Myers, 1990; Mullen & Riordan, 1988).

Concepts necessary to form attributions

Since this study is focused on the perceived attribution of an individual's behavior in groups, this review is further concerned with the integration of the concepts of *diversity*, *social perception*, and *social categorization*. Simply defined, *diversity* is

the different categories individuals use to describe themselves and others, and such categories are needed for the differences among group members to be attributed and measured by other members. *Social perception* allows us to examine the traits of the evaluating member, as these may impact the way competence is determined. Finally, *social categorization* is the way a group member's competence is attributed, or how they are categorized. All three concepts are necessary to understand how perception of self and others is formed. These concepts explain "how" members attribute outcomes differently. Attribution theory links these concepts together, providing a basis for "why" members attribute outcomes differently.

Diversity

For the purposes of this study, diversity can result from any attribute or category people use to tell themselves that another person is different. This definition of diversity is based on a social psychological perspective (Turner, 1987). Allport (1953, 1954) noted in her studies of prejudice and religion that individuals use categories to describe themselves and others. These categories are useful in simplifying and reducing a large amount of data into stereotypes that can be more easily used in decision making. Even though a large number of attributes could be used in perceiving others, those that are the 'most visible' are expected to be the most important markers of diversity in learning groups. 'Visible' attributes may become salient to group members although they are not relevant to the task (Williams & O'Reilly, III, 1998). For example, a visible attribute such as a member's age, gender, or race may have no bearing on that group member's ability to successfully help with a group task, yet visible attributes may

become the most important category when it comes to other's evaluations of their performance.

Social Perception

Social perception is the process by which people come to know and understand each other, and as such describes how one person perceives other individuals. Social perception provides a basis to study how the traits of the evaluator impact their perception of another member's competency. To make evaluations, a perceiver first observes the person, then the situation surrounding the person, and lastly the person's behavior. The perceiver will be strongly induced by confirmation biases to retain their initial impression (Champoux, 1996).

Three primary factors of social perception are found in the process of making attributions and in problems due to biases:

1) Stereotyping, which is the tendency to perceive another person as belonging to a single class or category, 2) Halo Effect, which is when a person is perceived on the basis of one trait, and 3) Attribution bias, or how people explain the cause of another's or their own behavior (Luthans, 1995, page 102). Stereotyping is a common bias when developing first impressions, because perceivers may use *physical aspects* of the person, such as demographic traits or other observable personal attributes. Another type of stereotype is when the perceiver may have preconceptions about the *situation* in which they see the behavior of other people, based on their own experiences in similar situations. Halo Effect error influences perception in that a person may infer several attributions from one unrelated trait. For example, they may perceive that an attractive person is smart or that a person that evades eye contact is shy. Finally, attribution may

bias perceivers since they tend to be influenced by their own locus of control when observing another's behavior in a situation. These three biases help explain the role of diversity in an individual's perceptions of others' "differentness", or in-group/out-group categorization. Level of all three biases will vary according to the background of the perceiver.

Social Categorization

Social Categorization uses the same social psychological perspective as diversity. Certain characteristics of the person being perceived influence that person's categorization (the trait perceived may or may not be task salient). Some social categories used in this study were gender, age, race, ethnicity, English fluency, major, and class standing. These traits were correlated with other's evaluations of performance to measure how another member's competency is or is not attributed. Zalkind and Costello (1962) found that:

1) the status of the person being perceived will greatly influence other's perception of the person, 2) the person being perceived is usually placed into categories to simplify the viewer's perceptual activities, (two common categories are status and role) and 3) the visible traits of the person perceived will greatly influence others' perception of the person.

Several studies have supported Zalkind and Costello's (1962) assertion that visible traits will greatly influence others' perceptions. Their findings show that under most circumstances certain demographic characteristics such as race, gender, and age are more likely to be salient (Cummings, Zhou, & Oldham, 1993; Pelled, 1996, Tsui, Egan & O'Reilly, 1992). For example, groups whose members vary by type of business

major are functionally diverse, and so will categorize on some other member attribute (probably visible) such as age, gender, race or ethnicity. The reverse would be true in a group composed mainly of senior Information Systems majors. The member that is a junior (lower ranking) and/or Accounting major (different function) becomes most diverse from the rest of the group, even if their visible traits (age, gender, race or ethnicity) are homogeneous to the group. In this example, class ranking or educational major is more likely to become the most salient category of performance evaluation.

Because Social Categorization theory predicts that visible attributes are used more because they are more easily detected, observable traits become more salient than truly task related skills such as knowledge, communication competency, dependability, etc. Once this basis of perception gets started, it is hard to change due to confirmation biases such as stereotyping and halo error. This prejudice leads ultimately to poorer group process and performance (Stephan, 1985).

While closely related, the difference between social perception and social categorization is in the viewpoint. Social perception sees diversity through the viewpoint of the perceiver, and measures another's level of diversity as the difference from the perceiver's own traits. On the other hand, social categorization focuses on the traits of the person being perceived. Diversity is measured as the level of difference of the person being perceived from some norm or average. As can be seen from this review, diversity is used to shape perception, and both perception and diversity are used to 'place' members into social categories.

Impact of Member's Personal Attributes

All groups have some degree of diversity in that members differ with respect to ability, age, personality, gender, race, seniority, or other characteristics. This review begins with a survey of studies whose independent variables were *personal* attributes. Researchers have referred to these types of attributes as immutable, observable, surface or readily detectable characteristics. It is the visibility of these attributes that are particularly likely to evoke responses that are directly due to bias, prejudice, or stereotyping.

Next the review will cover the task competencies of the group member, which are *underlying level* attributes. Underlying attributes are also referred to deep attributes because these variables are not inherently visible. These non-visible measures are communicated by verbal and nonverbal behavior patterns, and are only ascertained by extended interactions and information gathering (Harrison, et. al., 1998). Types of underlying diversity measures include attitudes, knowledge, skills, and values or beliefs. These non-visible attributes are more likely to be essential to task success. Underlying attributes that are task related are used in this study to measure task level diversity, or the differences between members in levels of individual task competency.

A review of the literature finds that most studies of diversity explore a *visible* or *observable* trait's direct effect on a single outcome, and so are univariate in analysis. Even those studies that measured multiple traits and characteristics tend to describe findings in terms of univariate measures. This permits a review of personal diversity that clearly lists each study under the heading of the visible trait, or independent variable reported. A review of the literature involving each variable examines that

trait's impact on actual effects such as performance and satisfaction. Important to the study of perceived outcomes are measures of affect, or emotional response, and measures of liking, or attraction. For these reasons, a review of the literature involving each variable also examines that trait's impact on perceived effects such as affect or liking. Also reported are other important findings that touch on this study such as group composition, task performed and group tenure. Like the review of personal diversity and demographics, the review of underlying level attributes is also organized under the subheading of the attribute, or independent variable that was studied, and will also review outcomes, task, and group tenure. The review of underlying attributes is focused on those task skills, abilities, and behaviors that most likely impact the perception of a member's level of task competency.

Of particular interest to this experiment are longitudinal studies of heterogeneous groups. Very few studies of these types of groups were found. For almost all the personal traits researched as independent variables, the longitudinal studies had opposite findings than those that used ad hoc groups. For this reason, longitudinal findings will be placed at the end of each subheading.

Personal Attributions of Diversity

Most small group research regarding the influence of diversity has been concerned with the impact of heterogeneity within a group. Harrison, Price, and Bell (1998) defined a similar concept, surface level heterogeneity, as differences among group members in overt, biological characteristics -- like those typically reflected in physical features. To a lesser degree, attributes that are not physical in nature have been studied - such as organizational tenure or nationality. This study adopts a broader view

from Jackson and colleagues' (1993) study of observable attributes, and so defines personal diversity as differences among group members in attributes that are generally immutable, almost immediately observable, and measurable in simple and valid ways (Jackson, May & Whitney, 1995).

Gender

Several studies indicate that gender composition affects group process and performance. Alagna and Reddy (1985) found that members of mixed gender groups reported higher levels of interpersonal conflict, poorer quality of communication and less satisfaction than all male groups. Despite the higher levels of tension, mixed gender groups did not report significantly different ratings on task competence or self-influence on group activities. In another study of gender composition and affect, Fields and Blum (1997) found that satisfaction levels of employees working in gender balanced groups were significantly higher than those of employees working in groups containing mostly men or mostly women. Alexander, Lichtenstein & D'Aunno (1997) measured member's assessments of team functioning in health care teams. Alexander and colleagues found that the greater the gender diversity, the more negative the team member's assessments of team functioning.

Gender diversity may also affect group performance. In a study of team decision quality involving a 45 minute winter survival exercise, as the number of males in the four person ad hoc team increased, so did the decision quality. However, lone female teams (three males and one female) outperformed all-male teams (Rogelberg & Rumery, 1996). All-male teams did not have the highest quality decisions. Wood, Polek and Aiken (1985) also found differences in the way males and females interacted

in a group. On problems that were neither traditionally male nor female, members of male groups were somewhat more task-oriented, and spent more time producing solutions than female groups. In contrast, members of female groups placed a higher value on group agreement and accord, and were more likely to take turns talking. Wood et al. concluded that the difference in interaction styles between males and females affected performance.

Overall, gender's influence on outcomes ranged from negative to inconsequential. When measuring task performance, male dominated groups seem to do better (Rogelberg & Rumery, 1996; Wood et. al, 1985). In measures of group process or group satisfaction, groups with equal number of males to females had mixed outcomes (Alagna & Reddy, 1985; Alexander, et al., 1997; Hawkins & Power, 1999). Gender differences in interaction may have more impact in gender diversity than the length of group tenure.

Age

Like gender, persons of atypical age (older or younger) than the group may experience negative effects. Zenger and Lawrence (1989) found that age heterogeneity was correlated with lower levels of communication in surveys of engineers in 19 project groups of three to nine members. This study found that employees that are relatively similar in age would communicate more frequently about technical issues than employees that are relatively dissimilar. On the other hand, it was organizational tenure, not age, that had a greater impact on communication outside of the project group. Interaction within the group was more strongly impacted by age differences than interaction outside the group.

In a study of age's impact on group performance, Sessa (1995) proposed that conflict is a mediating variable between team heterogeneity and performance and/or turnover. In her study of nursing teams, she found that race and age led to an increase in conflict directed toward group members rather than the task. However, results about the relationship between conflict and performance were not clear.

In general groups that are heterogeneous with respect to age seem to have greater difficulty communicating effectively. On the other hand, while members in age diverse groups have barriers to group communication, they have greater links to others outside the group, which has potential for a greater pool of resources than with age homogeneous groups. This helps explain why age diverse groups may have mixed results on outcomes of performance. Age diversity tends to lead to low communication and increased conflict. In the short run, this may lead to negative group processes and low performance. Over time process and performance may improve as outside links are forged and internal communication is increased.

Race

In a review of empirical studies Marvin Shaw (1981) notes that the racial composition of the group influences the feelings and behaviors of the individual members, especially of black members. Sometimes, but not always, feeling and behavioral differences negatively interfered with group performance. In groups where the status among blacks and whites came closer to equal, differences were decreased. Shaw proposed that when blacks and whites come closer to equality in status that the effects of racial composition may decrease and perhaps even disappear (Shaw, 1981 pg. 251).

The impact of racial diversity on the objective process and performance of heterogeneous pairs showed negative outcomes. Fenelon and Megargee (1971) measured the performance of racially mixed and homogeneous pairs on a brief clerical task that required a decision. Subjects were black and white American college women. Fenelon and Megargee found that racially mixed pairs took longer to reach a decision than racially homogeneous pairs. Ruhe and Allen (1977) had a similar finding for groups working on a knot-tying or ship-routing task. All white and all black groups performed the task more quickly than racially mixed groups.

A study of racial diversity's impact on perceptions found that minorities tend to be less satisfied. Riordan and Shore (1997) studied the effect of demographic composition on individuals in a life insurance company's workgroups. Their study reports that racial composition made differences in the perceptions of opportunity and attitudes towards one's work group for Blacks, Whites, and Hispanics. For example, their study found that Hispanics in mostly White or Black work groups scored lower in work attitudes (such as satisfaction). Hispanics did not have the same negative attitudes in truly diverse groups (their sample had no Asians).

Negative outcomes were also found in a study of member performance and attitude that involved a decision making task. In a study by Li, Karakowsky & Siegel (1999) members who were a racial minority tended to behave differently than members with equal or majority group representation. Li, et. al. studied the effect of proportional representation using Asian males in student groups. Groups with three types of composition (Asian minority, equally Asian & non-Asian, and Asian homogeneous) were videotaped while completing a 30 minute ranking exercise that required a

consensus decision. Outside judges ranked the Asians that were a minority in their group as passive, introverted, alienated, withdrawn, and as participating less in the discussion. Minority Asians were also perceived as sad, depressed, and resentful. Asian members in the equal or homogenous groups did not exhibit the same behaviors as their counterparts, leading the authors to an opinion that behaviors previously believed to be cultural may be due to a member's minority group status.

In contrast to the negative findings of the studies just reviewed, a longitudinal study by Cooper, Johnson and colleagues (1980) examined the impact of cooperative tasks, interpersonal competition and individualistic efforts on attitudes between majority and minority elementary students. Cooperative tasks, when compared with competitive and individualistic tasks, were found to result in stronger beliefs of being liked, supported, and accepted by other students, regardless of race.

In their meta-analysis of research conducted between 1944 and 1982, Johnson and colleagues found that cooperative interdependence was key in structuring interaction in heterogeneous groups in a way that promoted member's attraction to each other (Johnson, et al., 1983). The authors pointed out that it was the type of task interaction rather than the extent of time together that increased interracial interaction, possibly through eliminating bases for stereotypes.

A longitudinal study of decision making by student groups found that racial diversity had different impacts on group process and performance at different points in the group tenure. Watson, Kumar, & Michaelsen (1993) conducted a longitudinal study to determine how the performance and group processes of heterogeneous and homogeneous groups compared over time. Heterogeneous groups were determined by

national and racial differences. Both heterogeneous and homogeneous groups of 4 to 5 people interacted frequently in a classroom setting for 17 weeks. All groups were similar in regard to age, gender, years of work experience and educational achievement. Groups were given case studies at week 5, 9, 13, and 17, and given one hour in class to complete their analysis. Though both groups showed improvement over time, the differences between homogeneous and diverse groups gradually decreased. Initially, homogeneous groups scored significantly higher on all process and performance variables. In the ninth week (time 2), the homogeneous groups scored higher than heterogeneous groups on problem identification, quality of solutions, and overall performance. By week 13 (time 3), the homogeneous groups scored higher than diverse groups on quality of solutions, while diverse groups scored higher than homogeneous groups on range of perspectives and alternatives generated. At that time, overall performance was the same for both types of groups. However, by week 17 (time 4), diverse groups showed a significantly greater range of perspectives and generated more alternatives than the homogeneous groups, while overall performance for both groups was the same. This insistent pattern of improvement for heterogeneous groups led the authors to note that the performance characteristics of newly formed groups were very different from those of longer-term groups. Racially and ethnically heterogeneous ongoing groups had higher quality ideas in problem solving tasks in the last half of a semester – implying that diversity of background increases creativity, but teams must be given time to overcome process problems.

Ethnicity is closely correlated to race since often persons of a different ethnic background are different racially as well. Many older studies of the desegregation of

elementary schools found negative impacts of ethnicity on affect and performance of students. These longitudinal studies showed that students that associated with other ethnic members would be less accepted by their own ethnic group (Shaw, 1973), students actually became more prejudiced (Gerard, Jackson & Connolley, 1975), and that ethnic cleavage was more pronounced over time leading to less acceptance of ethnic members by students (St. John, 1975).

By contrast, in a series of experiments by Johnson and Johnson (1981 & 1982) cooperative learning, where the achievement of each student's goal is linked to the success of other group members, had strong positive affective outcomes. Cooperative learning was compared to individualistic (goal achievement is independent of other's success) (Johnson & Johnson, 1981) and competitive (goal achievement is possible only at expense of other's success) (Johnson & Johnson, 1982) classroom assignments. Fourth grade students in each condition were together for 15 days, 55 minutes a day. It was found that students in cooperative groups had higher cross-ethnic interaction on all variables measured, which included 1) frequency of interaction during instructional session, 2) frequency of interaction during free time in class, 3) giving and receiving help, 4) desire to play together, and 5) desire for interaction five months later. The authors point out that group tenure was the same for all three conditions, but the type of assignment varied.

In another study of member affect and attitude using workers in the Netherlands, group members that weren't Dutch began with lower satisfaction rates than their Dutch counterparts. As they spent more time with their Dutch colleagues, though, their satisfaction increased (Verkuyten, De Jong, and Masson, 1993). This study also

measured ethnicity using Hofstede's cultural dimensions. The authors found that people that were different along power distance and collectivism from Australian host workers perceived more discrimination, while valuing cultural diversity more highly.

In a study of ethnicity's impact on group performance, Cox, Lobel and McLeod (1991) found that ethnically diverse student groups made more cooperative choices than all-Anglo groups in a two-party prisoner's dilemma game. Groups were made up of paid volunteer students that were randomly assigned to either ethnically diverse or all-Anglo conditions. Students were undergraduate or graduate and came from several majors in a large public Midwestern university. The groups were intact for the 2-3 hours necessary to run two conditions of the game; a no-feedback condition and a cooperative feedback condition. Ethnically diverse groups acted more cooperatively than all-Anglo groups, and behavioral differences increased when the situational cues favored cooperation.

In a study of face to face teams with a relatively short problem solving task, Cox (1993) found that member diversity in terms of ethnicity and national origin seemed to result in higher coordination problems and less effective teams in the early stages of group processing. Yet, with brainstorming tasks, the benefits of member diversity may be captured, even in early group stages. McLeod, Lobel and Cox (1996) examined the effects of ethnicity on idea generation and group creativity in a lab setting, using a task that involved an appeal to diversity of ethnicity (brainstorm ways to increase tourism to the United States). Ethnically diverse ad hoc student groups produced more effective and feasible ideas during 15 minutes of brainstorming than homogeneous groups. On the other hand, homogeneous groups reported slightly higher levels of interpersonal

attraction. The authors suggested that the nature of the task interacted with the early stage of group development to increase the positive effects of ethnic diversity on group outcomes.

Conversely, another study by Watson, Johnson & Merrit (1998) did not result in outcomes that reflect higher performance by diverse groups over time. Watson et. al. (1998) divided upper level management students into semester-long teams that were either homogeneous (white American) or culturally diverse (four-member groups contained a White American, Black American, Hispanic American and one other foreign national). Data was collected at three five-week intervals on three graded group tasks that sequentially comprised a written analysis of a case study. The primary outcome measured was self- vs. team orientation. The diverse teams reported more self-orientation across all three points in time, and performed better for the first two time periods. For the last time period, the homogeneous team did better. Correspondingly, for the last time period the homogeneous teams reported the highest self-orientation than for their other two project segments.

Language is another trait that is closely correlated with both race and ethnicity, since that member whose native tongue is diverse from the group norm is probably also diverse in race and ethnicity. Language is a key element in our perceptions of individuals, since it is significant in the way they present themselves, their ideas, and their decisions. Rich (1998) found that minorities lack “small talk” skills—partly as a result of poor fluency, partly through lacking ability to send “encrypted” signals. He states, “This article recognizes that minorities and women can have separate codes of communication, and that they also can use codes to keep other groups out of the

communication loop. However, most knowledge-based organizations are dominated by White males. Serious organization business is being conducted in a linguistic code that excludes women and minorities..." (page 327). As higher education institutions are knowledge organizations, Rich's findings can be directly applied to student groups.

In an empirical study of why minorities contribute less in groups, communication competency was found to explain much of the variance normally attributed to race or ethnicity (Kirchmeyer, 1993). Students formed ad hoc groups and engaged in a forty-five minute interactive decision task. Minorities contributed less due to low communication competence, low assertiveness, and a high concern for others. These variables accounted for more variance than minority status alone—and the strongest explained variance was due to communication competency. It was determined that communication competency was very instrumental in judging a member's contribution level on an interactive task.

In predictions of effects of diversity on group performance, Hambrick, Davison, Snell, and Snow (1998) suggest that a low degree of common language facility will impair group functioning because exchange of information and trust is lower. This is expected to be greater for groups with coordinative tasks. "Differences in outward behavior such as conversational style, body language, and punctuality bring about interpersonal distrust and disdain" (Hambrick, et. al., 1998, pg. 195). The study of ongoing groups by Watson, Kumar and Michaelsen (1993) suggest that time spent together may play a role in how communication differences affect a group's functioning, in that trust and rapport has a chance to overcome language barriers and develop.

To summarize, racial, ethnic, and language skill diversity seems to have negative impact on short-term groups. Heterogeneous ad hoc groups seem to suffer more process loss due to increased diversity and have more negative attitudes regarding the group. Conversely, over time and/or with a cooperative task, heterogeneous groups become equal in performance with homogeneous groups, and may have superior idea generation or creativity.

Underlying Attributions of Diversity – Task Competency

Milliken and Martin (1996) pointed out three common types of underlying (called deep-level) attributes or characteristics that have been studied. The first relates to differences in personality characteristics or values of the members of the group. Usually these attributes are used to measure orientations toward issues or interaction styles. The second type of underlying diversity may be measured through organizational cohort membership. Finally, deep-level heterogeneity may be measured by diversity in skills or knowledge. Measures such as educational background, functional background, occupational background, and range of industry experience are particularly relevant in organizational settings (Milliken & Martin, 1996).

This study is concerned with the underlying level attributes that comprise the skills and knowledge of the individual members. Of particular interest are knowledge and skill traits that determine a member's competence on group tasks. The types of task competencies reviewed include functional skills or background, occupational background or experience, and educational specialization. As mentioned, far fewer studies of underlying task level than personal level diversity have been made.

Knowledge

Several studies of functional background have examined top management teams. Bantel and Jackson (1989) in a study of top bank management teams found that functionally diverse groups made a greater number of administrative innovations (this was not significant for technical innovations). Functional diversity was also correlated with more frequent communication within the group for teams in the upper echelons of management (Glick, Miller and Huber, 1993). In top management teams, functional diversity was associated with positive performance returns such as Return On Assets (Korn, Milliken, & Lant, 1992). Ancona and Caldwell's (1992) study of 45 product teams found that functional diversity had a negative direct affect on innovation and team-rated performance in product teams, but a countervailing positive indirect effect on innovation due to communication with those outside the group. The impact of diversity in functional background on actual or perceptual outcomes has had mixed results. Generally, diversity in functional composition of groups may lead to positive actual outcomes but negative perceptual affects.

There were no studies of functional or occupational diversity and affect outcomes such as liking or satisfaction, and almost all studies focused on cognitive outcomes such as innovations on strategic decision. Overall, functionally diverse teams were more innovative when the task required information from outside the group, as in strategic decisions. An explanation may be that functionally diverse groups may have greater process losses than homogeneous groups, but overcome those losses by building more linkages with those outside the group. Milliken and Martins (1996) suggest that these linkages create a greater network, giving more access to information. This is

supported by Simons' (1995) theory of group conflict, which states that only decision processes that allow debate will positively associate diversity with performance.

The few studies of educational diversity analyzed top management teams. Differences in educational curriculum or specialty were positively related to change in diversification strategies (Wiersema & Bantel, 1992). However, Bantel and Jackson (1989) in a study of top bank managers found that educational specialization had no effect on innovativeness of the top management team. Once again, Simons (1995) theory of group conflict may be a basis of support for these findings. Simons suggests that team diversity would be advantageous only when the group used a process that allowed the members diversity to surface in open debate. In the first study of several different firms, a debate of strategies led to diversification, while in a study of banking institutions, strategic decisions were not geared towards a debate involving change.

Summary of Diversity Literature

In the vast majority of studies diversity of any kind seems to produce negative effects on group process and performance. Anecdotally, most researchers realize that time (for member interaction) and type of task are important variables in the group process, but there are not many studies that capture their effects. Most studies used short-term groups engaged in game or role-playing tasks rather than ongoing groups in their regular work setting. While the literature seems to support an assumption that diversity is negative, the artificial setting of the studies may have led to a skewed misunderstanding of real-world group processes.

In the short run, diversity seems to hurt group outcomes. Conversely, the studies that studied groups over time found positive effects from diversity. In addition,

longitudinal studies of deep level attributes are supporting the beginning of a new paradigm for small group researchers. Recently, Harrison, Price, and Bell (1998) found that personal differences in traits were less important and underlying level differences such as task competencies were more important for groups that had interacted more often. This finding is in contrast to other studies of ad hoc groups, but has more relation to actual group processes. It is supported by the few other longitudinal studies of groups we reviewed above which found positive effects such as stronger beliefs of being liked, supported, and accepted (Cooper, et. al, 1980) and group ideas of higher quality and creativity (Kumar, et al., 1993).

On the other hand, the literature doesn't wholly support an alternative assumption that groups of short duration are harmed by diversity while long-term groups are benefited. There are studies that show exceptions to the pattern of diversity being advantageous over time. A study by McLeod, Lobel, and Cox (1996) found that diverse short term groups outperformed homogeneous groups. A longitudinal study by Watson, Johnson and Merritt (1998) found that long-term diverse groups underperformed homogeneous groups. Finally, a series of studies by Johnson and Johnson (Johnson and Johnson 1975, 1981,1982; Johnson, Johnson et al., 1983; Johnson, Johnson, and Scott, 1978) found long-term diverse groups using a cooperative task outperformed long-term diverse and homogeneous groups using an independent (competitive or individualistic) task.

In each of these exceptions, the type of group task was a critical component. For example, where short-term diversity had positive outcomes a simple brainstorming task was used (McLeod, et. al., 1996). Brainstorming has low communication and

interaction requirements and is basically an individual, rather than group, task. In the study where long-term homogeneity had superior outcomes to diverse groups (Watson et. al. 1998), the task was again basically individual. Unlike the earlier study by Watson, et. al. (1993) in which students came to consensus on three different cases while in class, the task in the 1998 study was essentially a written paper, whose three graded components (financial analysis, SWOT analysis, recommendations) had to be completed outside of class and so were probably divided and assigned among the group members. Self vs. team orientation may not be as responsible for this study's divergence from the pattern of other literature as much as the lack of interaction required for the task.

Finally, Johnson and Johnson's series of studies showed that it was not the amount of time or frequency of group meetings that led to positive affective outcomes for diverse groups, but was instead the cooperative learning assignment, which required group members' interaction. Further support for their assertion that it was the type of assignment, not frequency, of structured interaction came from a meta-analysis (Johnson, et al., 1983) of 98 studies.

To ensure positive outcomes in diverse groups, the literature suggests two critical variables: time and task. Giving groups enough time to interact without assigning a task that requires interaction may not result in positive outcomes for diverse groups. On the other hand, assigning interactive tasks without providing enough time for groups to interact will probably result in negative outcomes in diverse groups. An interactive task assigned to ongoing, intact diverse groups, resulted in positive outcomes such as increased creativity and interpersonal attraction.

Nature of the Task

So far, this chapter has reviewed the impact of member attributes on group outcomes, yet the nature of the task has long been recognized as another important factor. Along with member traits, which may affect a group's beliefs about a member's ability to perform, task characteristics also shape perceptions of performance.

Because this study deals with subjects that are in an environment of higher education, examples for typology and categorization will include instances from the educational setting. For this reason, the terms "task" and "assignment" are used interchangeably. This review ends with an overview of literature regarding outcomes that correlate with the nature of the task. The review is separated into two major categories based on interdependent tasks that require high levels of member cooperation vs. the independent tasks as defined by the task's divisibility or member's independence.

The Influence of Task

Inconsistent results from group diversity literature has led to a theory of routine in the group task as a mediating variable (Filley, House, & Kerr, 1976). While not empirically verified with consistent results, a recurring theme in the literature is that homogeneous groups perform routine problem solving best, while more ill-defined, novel endeavors are better handled by a heterogeneous group (Hambrick & Mason, 1984). For example, brainstorming exercises in heterogeneous groups contain more diversity of perspective and may result in more far-ranging generation and airing of ideas. In a conceptual article, the authors argue that different types of diversity give rise to different performance effects (Hambrick, et. al., 1998). The authors suggest that

multinational diversity poses the greatest difficulties for groups engaged in coordinative tasks, while creative tasks best capture the benefits of multi-nationally diverse members. Groups engaged in computation tasks show little positive or negative outcomes due to multinational diversity.

In a meta-analysis of forty-six studies involving group process and performance, Gully, Devine and Whitney (1995) found that the cohesion-performance literature had overlooked issues of levels of analysis and task interdependence - resulting in high levels of unexplained variance and mixed results. Studies were included as constructs of cohesion if they included terms of *performance*, *effectiveness*, or *productivity*, as well as *cohesiveness* itself. They then determined levels of task interdependence by rating dimensions of *communication*, *coordination*, and *mutual performance monitoring* as either “high” or “low”. After controlling for group size and differences in level of analysis, high task interdependence accounted for 46% of the 82.3% sampling error. They concluded that task interdependence strongly affected the strength of the cohesion—performance literature, and that the relationship was stronger for tasks requiring high interdependence rather than low interdependence. Gully, Devine and Whitney (1995) found strong support for the nature of the task as a mediating variable.

Another meta-analysis of 98 studies concerning the nature of the task and its influence on affective outcomes found that cooperative learning experiences promote greater interpersonal attraction among heterogeneous and homogeneous members than do competitive or individualistic learning experiences (Johnson, et al., 1983). As Johnson and colleagues stated “A key factor in determining whether desegregation promotes positive or negative relationships between majority and minority students is

the way in which classroom teachers structure goal interdependence among students as they work on academic assignments. By structuring positive or negative goal interdependence or goal independence between majority and minority students during academic learning situations, teachers can influence the pattern of interaction between majority and minority students and the interpersonal attraction that develops between them (Deutsch, 1962; Johnson & Johnson, 1975, 1980)".

Task Characteristics: Wood's Typology

Building on the work of Mcgrath and Altman (1966), Hackman (1969) and Hackman and Oldham (1980), Wood (1986) proposes two valid theoretical frameworks to use in the study of tasks: 1) *Task qua tasks* - tasks are defined by feedback 2) *Task as Behavior Requirements* - Tasks are defined in terms of the behavioral responses a person should emit in order to achieve some specified level of performance. Wood then combined "Task qua tasks" and "Task as behavior requirements", leading to the postulate that all tasks contain three distinct elements: acts, feedback, and products.

This study uses Wood's definition of task as consisting of a product and two types of task inputs: required acts and feedback. These three constructs are building blocks that represent the foundation of a general theory of tasks. Since this theory is general, it is applicable to both individual and group levels of analysis.

While every task holds all three of the elements, the relationship of the elements among members and each element's level on its own continuum create varied group outcomes. Those tasks that integrate high amounts of these three elements in a task are *complex*, and to the degree that they require interaction by group members they are *interdependent*. Those tasks in which the elements are so low that one member alone

can do them, or where the elements can be split among the members to be done individually are *simple*, or *independent*.

Behaviors/Acts

Another aspect of a task is the act(s) required to create the product. In manufacturing, this may involve a series of repetitive physical gestures. In decision making, where the product involves abstract thinking, this aspect may be visible more by behaviors than acts. Wood (1986) defines a pattern of behavior with some identifiable purpose or direction as an act. Not to be confused with a personality trait, the act required by a product is a task component, not a property of an individual. Using this definition, this study can examine the behavior and perception of a student in a learning group as a separate dependent variable, without confounding it with independent demographic variables.

Feedback

Based on the work of Slovic and Lichtenstein (1971), the study of information processing in human judgment described task stimuli as information cues. These information cues are utilized in judgment and inference tasks. Wood (1986) defined information cues as “pieces of information about the attributes of stimulus objects upon which an individual can base the judgment he or she is required to make during the performance of a task”. Information cues are not facts or data, but descriptions of certain properties concerning the stimulus for a task. Because this study focuses on learning groups, rather than manufacturing groups that employ physical or motor skills, information cues are an especially salient element of the task.

Information cues can come in the form of feedback and/or evaluations. Some feedback is inherent in the task itself, where performance is visible and immediately apparent. Other information cues may include feedback from the instructor, from the group, and individual performance evaluations.

Products

Finally, products are the group outputs which are derived from acts and feedback, and should be defined in terms of quantity, quality, cost, etc. Another important factor in the product is its saliency, and/or importance, to group members. Important or salient tasks can be expected to merit more student time than trivial tasks. Both the level of interaction and feedback are determined by the product required by the assignment.

Determining Task's Level of Interaction

Wood's task theory (1986) will be used to determine whether the assignment or task is categorized as interdependent or independent. Task complexity is a major determinant of that categorization. Tasks which are complex for the group are categorized as interdependent, while simple tasks are categorized as independent. Three basic elements can determine the amount of complexity, and hence interactivity, of a task. These three elements are the number of *components* involved in completing the task, the amount of *coordination* required to link all the components, and how significantly the task *changes* while being completed. This review will define each element of complexity and illustrate their application to classroom and learning group tasks.

How components determine complexity

Components of a task are distinct acts that need to be executed in the performance of the task, or distinct information cues or instances of feedback that must be processed in the performance of those acts. To determine how complex the components of a task are, Wood's typology simply adds the number of acts and feedback together. In comparing the complexity of two educational assignments, writing a paper is less complex in its components than giving a presentation over the same material.

How coordination determines complexity

Coordination refers to the nature of relationships between task inputs and task products. If the task product is a simple linear function of task inputs, coordinate complexity is relatively low. Low skill assembly line work, where a task component repeats or a series of components proceed in a set sequence, are examples of tasks with low coordination. In an educational group setting, a series of case studies, where an individual member each takes a separate component, has low group coordinative complexity when compared to one group case study where all members must come to consensus.

How change determines complexity

Finally, *change* refers to how frequently the task requires members to adapt to changes in the cause-effect or means-end hierarchy for a task during the performance of that task. When the relationships between task inputs and products are changing, the task's complexity increases. An example from the classroom that is low on dynamic

complexity is an individual test. While taking the test, the number of information cues is stable (amount of content the student retained) and the method of answering a question remains the same (make a choice). A group test is higher in dynamic complexity in that additional information is available through other members, and assumptions made individually may be reassessed and reevaluated with new and different decisions as to the right answer. Answers require skills of communication, listening, and persuasion, as well as decision making.

Tasks: Interdependent vs. Independent

Feichtner and Davis (1985) examined several factors in the learning group environment in their descriptive report of why some group experiences were perceived as positive, while other group experiences were frustrating and negative. One of their findings suggests that the assignment (product) is key. When the assignment's product is divisible, the group parcels it out amongst themselves and it essentially becomes an individual assignment. Feichtner and Davis (1985) reported that most divisible assignments resulted in negative group experiences. When the assignment required consensus or group effort, interaction was required and the reported outcomes were positive. An interactive assignment was vital to reports of a positive group experience.

Similar findings by Johnson and colleagues' meta-analysis support the premise that an interactive task correlates to positive affective and actual group outcomes. Not only did they find that members in the cooperative task (which requires students in a group to interact) are strongly higher in measures of affect and performance, but they found minimal difference between the lower outcomes of the competitive and individualistic tasks (Johnson, et. al., 1983).

Only through interaction can members gather information about each other. The importance of information gathering by group members was supported by Harrison, et. al. (1998). The authors refuted the commonly held premise in the literature that differences among group members have a negative impact on group functioning. Building on the findings of Watson, Kumar, and Michaelsen (1993) that group cultural diversity can have positive performance effects, Harrison et. al.'s study focused on the issue of which level of difference is most important in ongoing groups; surface level (personal) or deep level (underlying) attributes. They found that it is the underlying differences, which can change perceptions through the process of information gathering, which are most important to effective group functioning.

As noted before, a common thread running through the literature that reported positive outcomes in diverse groups was assigning an interactive task. The importance of an interactive task lies in its ability to help group members through the process of gathering information about each other. This dissertation study therefore used two categories of task; interdependent and independent.

Interdependent Tasks

Feichtner and Davis' (1985) found that interdependent assignments were more satisfying than independent assignments. In a descriptive report of reasons for student's negative reactions to group work, Feichtner and Davis (1985) found that 4 or more group tests (an interdependent task) resulted in a positive group experience. Group exams have several interrelated task components and part of their positive influence may be because exams assure group time in class. The authors opined that the more

time groups spent together, the more cohesive they became which in turn made for a more positive experience.

Providing class time for group members to interact is also supported by Johnson and Johnson's concept of cooperative tasks. One of the essential elements they advocate as necessary for positive outcomes is "face-to-face promotive interaction". The Johnsons suggest that teachers maximize the opportunity for students to promote each other's success by helping, assisting, supporting, encouraging and praising each other's efforts to learn. By promoting each other's success, the group had higher achievement levels and members became better acquainted with each other on a personal as well as professional level.

Group exams exemplify a second essential element of the Johnsons', which is positive interdependence. Positive interdependence refers to the perception that a member is linked with others in such a way that they cannot succeed unless other members do. This increases the task's saliency to group members.

Another study involving cooperative tasks is Harrison, Price and Bell's (1998) which used two samples of groups. One group consisted of hospital employees that worked daily face to face and were rewarded as a unit (group) to promote cooperative contact. The second group consisted of employees in deli-bakeries from a grocery store chain that worked daily face to face in a cooperative environment. The importance of Harrison et. al.'s (1998) study of group diversity comes from examining the mediating variable of time. Although time was the actual variable measured, the authors stated that the fundamental medium is information. Time provided group members the

opportunity to get to know each other on a personal level, and understand how member differences affected their contributions to the group task.

Previously reviewed, Johnson et. al.'s series of studies compared cooperative tasks (which require interaction) with competitive tasks (which are accomplished individually). Cooperative group assignments had a positive influence on learning groups' affective processes (Johnson, et. al, 1976; 78, 81, 82). In a study that compared cooperative tasks to competitive tasks (tasks took 17 days for an hour a day), an identical task had different reward contingencies. In the cooperative condition, the students' reward increased for interacting, while in the competitive condition, the students' reward increased when they did the work themselves and avoided asking for help. Fifth graders in the cooperative condition were better able to understand the viewpoints of others, exhibited more altruism, were more positive about classroom life, and had higher achievement as measured by errors on tests and assignments. These students also exhibited a higher intrinsic motivation (Johnson, et. al. 1976). Another study in this series compared cooperative learning assignments to other types of tasks. Johnson and colleagues found that cooperative tasks resulted in higher interaction between racial and ethnic students during instruction and up to five months after (Johnson, et. al., 1981, 1982). An important point is that although the task product for these students was the same, Johnson and colleagues changed member interaction through reward contingencies. Another way to improve group interaction is through tasks that reward interaction.

From the literature, it seems that the nature of group tasks can determine the amount of member interaction. Increased interaction leads to increased knowledge

about each other, which decreases the amount of time that groups use “proxies” or stereotypes. Decreased use of stereotypes decreases the negative impact of diversity, and therefore increases the quality of group decision making and cohesion.

Independent Tasks

In contrast to interactive tasks, studies of independent tasks have correlated to negative outcomes, such as unfavorable perceptions and lower performance. Students naturally tend to divide the learning task when it involves skill acquisition or information, rather than problem solving or synthesis of material (Sharan, 1980; Aronson, Stephan, Sikes, Blaney, & Snapp, 1978). The result is an aggregate of individuals without a collective academic purpose or cooperative learning goal (Sharan, 1980). Most research shows group work to be more positive than individual work, but some research has found that a skill or information acquisition group assignment results in no better achievement than an individual assignment (Slavin, 1978). This type of group assignment by itself could fail to affect academic achievement (DeVries & Slavin, 1978; Slavin, 1978). Usually students with a (problem solving) group assignment benefit from helping each other achieve (Cooper, Johnson, Johnson, & Wilderson, 1980; DeVries and Edwards, 1974; DeVries, Edwards, & Slavin, 1978) -- even for a high-ability member with low-ability students in their group (Michaelsen, Watson, & Black, 1989).

Dividing the assignment out to those members who have relevant expertise can lead to a perception of uneven contribution. Students will like those who facilitate their goal accomplishment, and dislike those who obstruct their goal accomplishment (Ashmore, 1970; Berkowitz & Daniels, 1963; Johnson & Johnson, 1982). Poor

contribution, or even the perception of poor contribution, can lead to an acrimonious outcome such as a member being disliked (Tjosvold, Johnson, & Johnson, 1981) or seen in a negative light (Michaelson, Fink & Knight, 1997).

Feichtner and Davis (1985) found that assignments that could be divided merely accentuated the negative aspects of working in a group, with none of the benefits. Independent tasks more often triggered a group experience rating of “worst”. In fact, as few as one written report or class presentation triggered a negative response. As the number of written reports increased, the group experience diminished, so that by the time that three group reports were required, these groups were most often rated as “worst”. Similarly, when two or more class presentations were required students were much more likely to report a negative (worst) experience.

In addition, having too few graded group assignments was detrimental to the group experience. Feedback that is ongoing produces a more positive group experience than feedback that comes at the end of the term. Examples of end-of-term feedback are the student’s grade, peer evaluations, or a group project that counted as a substantial portion of the grade. Interactive tasks such as several group exams, on the other hand, have immediate or prompt feedback, providing groups the opportunity to change and improve before they take their next exam.

Differences in Group Outcomes

The major difference between the studies that supported conventional wisdom—that heterogeneous groups have negative outcomes—and the studies just cited—that proposed positive outcomes—is that the former were ad hoc groups engaged in one time (often trivial) tasks, while the latter (Watson, et al., 1993; Harrison, et al., 1998)

were longitudinal and intact groups working on real tasks. Real tasks tend to be more complex and interactive and have more saliency to group members.

In addition, when tasks are interactive (Feichtner and Davis, 1985; Harrison, et. al. 1998; Johnson, et. al., 76, 81, 82; Watson, et. al. 1993) a member's affective response to others and to the learning experience is more likely to be positive. Tasks that are low on interactive dimensions make members more likely to evaluate other group members based on personal traits. On the other hand, tasks that are highly interactive lead to evaluations based on others' underlying task competencies (Harrison, et al., 1998; Johnson, et al., 1983).

Summary of Literature

To summarize, most research indicates that diverse groups have more process problems than homogeneous groups. In diverse groups, there were greater differences in interaction styles and groups experienced more tension and conflict. Diverse groups took longer to make decisions. Although tension endured throughout the lifetime of mixed gender groups studied by Alagna and Reddy (1984), the implication of the Watson et al. study (1993) is that process problems may diminish as a group develops. Harrison et al. (1998) suggests that as members gain information about each other's attitudes and personalities, personal (surface) level diversity weakens and underlying (deep) level diversity strengthens.

The way members gain information about each other is through interaction on the group task. An interactive task was suggested by Feichtner and Davis' (1985) report as vital to a positive group experience. A meta-analysis on task type (Johnson, et al., 1983) found that cooperative learning experiences promote greater interpersonal

attraction among heterogeneous peers than do competitive or individualistic learning experiences.

This study hopes to extend the Johnson & Johnson (1975, 1976, 1980, 1982, 1983) studies by examining the affects of member traits on attributions in heterogeneous student groups at the collegiate level. In addition, this study builds on the Feichtner and Davis (1985) report by examining member characteristics and their influence on members' perceptions of the task and learning experience. This study expects to find that the mediating variable of the nature of the task is more critical than independent variables such as member traits and attributes for the success of groups. It is hoped that through studies such as this one that methods of improving business education harmony while preserving individual differences can be found.

Conclusions and Implications for Research

At present, it seems that diversity in ad hoc groups will result in negative outcomes, while diversity in longitudinal groups results in positive outcomes. Communication skill seems to have an impact beyond other underlying attributes reviewed in the literature, and further studies of the circumstances surrounding those findings seem warranted. The study of underlying attributes has just begun, whether they be based on task competency or not. Important questions regarding which underlying attributes have significant impact, or more impact than other underlying attributes remain to be answered. Finally, only in further work with longitudinal studies can the questions surrounding the mediating variables of time and task be addressed. This study suggests that it is the exchange of information *made available by task*

requirements for interaction that make the difference between the importance of surface diversity and underlying diversity.

Chapter Three: Research Design and Methodology

The purpose of this study is to determine the group assignment's influence on attributions toward other members and the learning situation. Its focus is on learning groups, and the assignments, or nature of the tasks, which are perceived to be most effective or least effective in those groups and which are most influential on member's perceptions of each other. This study will also examine the group dynamics of members' personal attributes and task competency in small group learning environments.

Primary Research Questions

The primary research question of this study is how the nature of the task impacts member perceptions of group learning experience and of other group member's performance. A secondary research question will address the role of diversity in evaluations of a learning group member's performance and learning group effectiveness.

This study investigated the following research questions:

1. Does the type of task have an impact on perceived learning effectiveness?
2. Does the type of task have an impact on member perceptions of each other?

Conceptual Model of Study

A conceptual model proposing relationships among member attributes, the group task, and perceptions of competency and learning experience is shown in figure 3.1 below. The specific hypotheses and conjectures that explore this model follow.

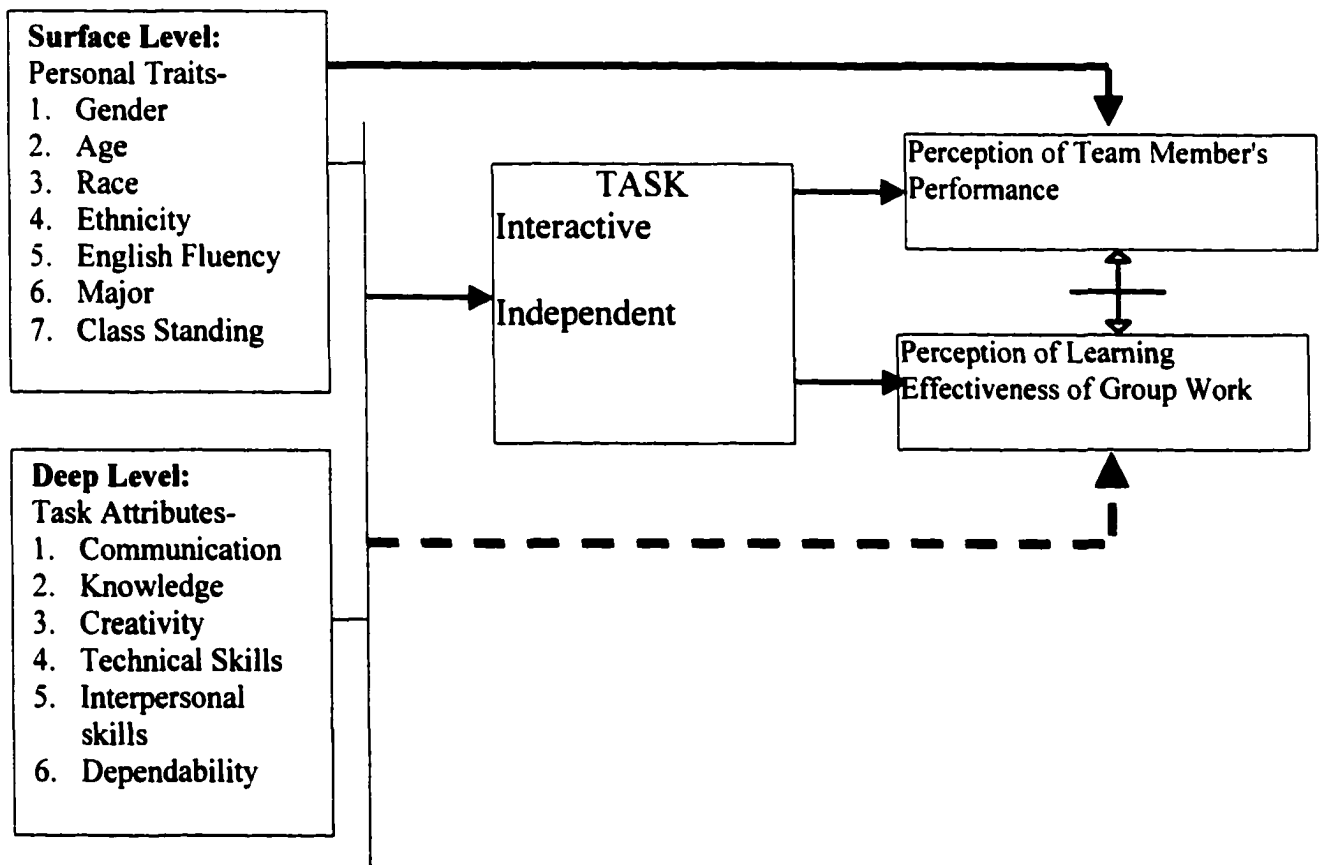
Figure 3.1

The importance of the nature of the task to member's perceptions and learning experience

Independent Variables:

Mediating Variable:

Dependent



Specific Hypotheses & Follow-up Conjectures

To study the impact of the task on group member perceptions, a sample population of North American Business College students was surveyed. Students enrolled in capstone courses were questioned concerning group assignments to address the following hypotheses:

Null Hypothesis 1: There is no difference between interactive tasks and independent tasks in a group member's resultant *perceptions of learning effectiveness in groups*.

Null Hypothesis 2: There is no difference between interactive tasks and independent tasks in a group member's resultant *perception of another member's contribution to group performance*.

From previous review of the literature it is expected that null hypothesis one will not be supported. In that event, we will explore why tasks mediate perceptions of learning effectiveness in groups through a follow up analysis. We expect four conjectures to shed light on task type's importance to group dynamics. These conjectures explore the perceptions due to task capabilities or personal traits as mediated by interactive or independent tasks:

Conjecture 1) Interactive tasks will reduce the impact of another member's personal diversity in a group member's *perceptions of learning effectiveness*,

Conjecture 2) Interactive tasks will increase the impact of another member's task-related contributions in a group member's *perceptions of learning effectiveness in groups*,

Conjecture 3) Independent tasks will increase the impact of another member's personal diversity in *a group member's perceptions of learning effectiveness*, and

Conjecture 4) Independent tasks will decrease the impact of another member's task-related contributions in *a group member's perceptions of learning effectiveness in groups*.

The previous review of the literature implies that null hypothesis two will also not be supported. Similar to our previous conjectures, we will explore why tasks mediate perceptions of another members' group contributions through a follow up analysis. These conjectures also explore the perceptions due to task capabilities or personal traits as mediated by interactive or independent tasks:

Conjecture 5) Interactive tasks will reduce the impact of another member's personal diversity in *a group member's perceptions of another member's contribution to group performance*,

Conjecture 6) Interactive tasks will increase the impact of task-related contributions in *perceptions of another member's contribution to group performance*,

Conjecture 7) Independent tasks will increase the impact of another member's personal diversity in *perceptions of another member's contribution to group performance*, and

Conjecture 8) Independent tasks will decrease the impact of task-related contributions in *perceptions of another member's contribution to group performance*.

Survey Method and Design:

To evaluate these research questions, the variables of interest were measured using a survey. This section on method and design includes information regarding a)

subject selection and survey domain, b) procedures for data collection and c) instrument development.

Subject Selection and Survey Domain

The subjects were senior level students enrolled in a business capstone course in universities across the United States of America and Canada. This population was selected for 2 reasons. First, choosing a course that is only offered to a student their last semester increases their probability of past group involvement and optimizes their number of experiences with group work. Second, the population will need to include advanced students such as graduating seniors since by that time the level of course work probably has involved both independent group tasks such as paper writing and complex interactive group tasks such as problem solving and real or simulated projects. Graduating students have a greater basis of experience than lower level students do for comparing learning group tasks.

Procedures for Data Collection

A request for help in obtaining subjects was sent through electronic mail to members of the Strategic Management Division of the Academy of Management. The electronic mail included linked responses to web pages which explained the study, depicted its model (Fig 3.1), provided a download of both versions of the survey, and summarized the dissertation's focus and its impact and usefulness to professors. Faculty members from the University of Oklahoma's Price College of Business were also asked to suggest or solicit cooperation from other instructors and administrators of capstone

Business Policy or other Management courses. Any instructors recommended were called directly.

For each institution the instructor(s) of the capstone Business Policy and Administration course or similar Management capstone course was asked to be the survey administrator(s). The instructor did not have to be one that uses learning groups. Each instructor was mailed one survey and one answer sheet for each expected student, with 4-5 additional surveys in case there were more students than expected or a mistake was made and the respondent wanted to start over. Cooperation from participating instructors was obtained before the start of their semester so surveys would be on hand the first day of class. Surveying students the first day prevented them from reporting on a group in which they were presently a member, and also discouraged them from biasing their responses to match an instructor's beliefs concerning groups. The instructor was asked to randomly assign the survey for "Most Positive Experience" to half their class and "Least Positive Experience" to the other half. In this way, the survey was randomly assigned to two equal trial groups.

To increase instructor cooperation, an incentive in the form of information concerning the results of the study was offered. Survey results could give the instructor useful comparative information by showing tabulations of the overall results of the survey and the results for their particular institution.

Instrument Development:

As stated, the population of interest was students with past experience as members in learning groups. Specialized survey instruments for each type of institution that contained these learning groups was not needed, since the questions were

generalized to the learning group experience itself, not the topic of study, type of institution, or expertise of instructor. The mode of data collection was in-class survey (See Appendix A.1). Survey items include short answer, Likert scale, and selection from a range of items. The survey will screen respondents for level of learning group experience, then question them regarding that experience.

The survey instrument was used to explore the effects of the nature of the task on member's perceptions using measures of two sources of attribution. One measure of attribution uses personal traits and the other measure uses underlying task competency. Perceptions of personal attributions were measured using seven demographic member trait items. Task competencies were measured using six behavioral, value and attitudinal member items. The nature of the task is categorized as either Interdependent or Independent. Finally, the two basic dimensions being measured are learning experience and member performance. This section on instrument development will explain how measures of personal traits and task competency were developed, then how the nature of the task was categorized, followed by measures of learning effectiveness and perceptions of members. The explanation of how the instrument was developed will also address the issues of construct validity, or whether the variables studied are truly representative of the effects being measured (Maxwell & Delaney, pg. 30).

Instrument Development: Personal Traits

Personal traits are demographic in nature, and have been used in several other studies as a proxy, or substitute, for more complex constructs. One of the central arguments for using substitutes such as demographic variables is methodological (Lawrence, 1997). It is impossible for the researcher to look inside the minds of

subjects and directly measure intervening processes such as attitudes, cognitions, or values. Pfeffer (1983) suggests "measures of these processes and/or concepts have significant problems such as measurement error, difference in conceptual definitions, violations of theoretical parsimony, and low levels of explained variation". He argues that demographic variables are more easily measured and produce simpler, more efficient explanations, so they may be superior to the more traditional measurements. Demographic variables have also been used by scholars to study organizational outcomes when an intervening relationship is unknown. Although some concepts are not directly observable, they can be operationalized as associated with demographic predictors and outcomes. The resulting measures can then be tested for validity and reliability.

Yet, a major weakness of substituting demographic traits for measures of processes like member performance or learning experience is that it may violate the construct validity of the study. Construct validity is necessary to link psychometric notions and practices to theoretical notions (Kerlinger, 1986, p. 420), or to generalize from one set of operations to a referent construct (Maxwell, pg. 30). In this study, there are two subjective concepts: one is how the group learning experience is characterized, and its subsequent impact on evaluation of the learning experience, and the second is how the member is characterized, and what impact their characterization has on their evaluation. Directly observing how one member is characterized by another is impossible, and would be subject to the methodological problems mentioned above. The methodological issue surrounding personal attributes is basically, do simple

demographic traits have the ability to predict characterizations, and therefore predict evaluations of others?

To increase construct validity while using demographic proxies, this study uses the same measures which were validated in previous research, such as age, gender, and race. To further capture the personal demographic traits of the population of interest, which is students in a learning group, the study uses traits of language fluency, ethnicity, educational major and class standing. Similar traits have been previously validated in other research but their descriptions or names are somewhat exclusive to the organization environment. For example; language fluency is similar to other studies using proxies for communication competency, ethnicity is similar to the proxy "culture", educational major correlates to studies using occupational or functional background as proxies, and class standing may be similar to other proxies such as status.

Strengths and Weaknesses of using demographic measures

An implicit assumption in the use of demographics is that of congruence, or similarity, between the simple, objective, demographic trait and the complex, subjective, unmeasured concept. As stated earlier, Pfeffer (1983, p. 302) argued that demographic variables could be superior to subjective concepts because they were 1) directly observable, and 2) parsimonious models of human behavior. This argues that parsimony results from replacing several subjective concepts with a smaller number of demographic ones (Lawrence, 1997, p. 3). Several researchers have supported the assumption of congruence. Pfeffer points out that demography may do a better job at explaining variance in dependent variables than subjective concepts, because subjective

concepts are mental processes that are more difficult to assess and reliably measure (Pfeffer, 1983, p. 351). Wagner points out that demographic variables may be valid as explanatory variables, since they are not as prone to errors in recall (Wagner et. al., 1984, p. 80). Even though there are weaknesses due to the fact that demographic measures contain more noise than purely psychological measures, demographic data can yield significant findings (Hambrick and Mason, 1984, p. 196).

If this is true, the advantage of assuming congruence between easily observed demographic traits and invisible subjective concepts is clear. Researchers can eliminate subjective concepts without compromising a model's predictive or exploratory power. Demographic variables can be used as valid substitutes for relational constructs (such as "best member overall" or "most positive learning experience") without threats to construct validity (Maxwell & Delaney, 1990, pg. 30).

There are some disadvantages however, which can substantially lower the predictive accuracy of demographic measures. Lawrence (1997), in her critique of this type of methodology, pointed out that when researchers use demographic measures they often leave the actual concepts unmeasured and the hypothesis untested. This creates a "black box" of subjective concepts and their relationships. If the demographic variables and the subjective concepts are not related, the relationships can not be found to be truly significant and the construct validity of the experiment is violated.

To reduce possible threats to construct validity, this study uses Lawrence's (1997) two standards to assess possible ambiguities in congruence, which are 1) demographic measures must plausibly capture proposed theoretical constructs and 2) theoretical and empirical levels of analysis for the proposed constructs must match. As

can be seen from this study's literature review on Diversity, Social Categorization and Social Perception, demography does a fairly good job at capturing surface level personal attributions, which satisfies Lawrence's first standard. The issue of non-congruence often stems from the second standard – matching the level of analysis to the constructs. To match the study's level of analysis to the proposed constructs, the boundaries of the study have been carefully defined according to the five criteria suggested by Lawrence. By carefully matching analysis level to construct level, the study should minimize problems of using demographic member traits and maximize the assumption of congruence for measures of personal traits.

Instrument Development: Task Competency

Measures of task competency were developed using consensual assessment. Amabile (1982) first proposed consensual assessment as useful for constructs that focused on the judgment of products: "A product or response is creative to the extent that appropriate observers independently agree it is creative. Appropriate observers are those familiar with the domain in which the product was created or the response articulated".

The advantage of consensual assessment is its ability to increase content validity, and therefore construct validity. Content validity is the representativeness or sampling adequacy of the content of a measuring instrument. Content validity is guided by the question: "Is the substance or content of this measure representative of the content or the universe of content of the property being measured?" (Kerlinger, 1986, p. 417).

In this case, we used students as judges and asked them to determine the attributes of a valued group member using their own criteria of what was a "good performing" member. By implementing the steps below, students operationalized the skills, abilities and behaviors most salient when evaluating the performance of another group member.

Nine groups of 4-5 members in a junior level Human Resource management class were given instruction in creating job appraisal forms based on the Knowledge, Skills, and Abilities Absolute Judgment format. They were then instructed to form a job appraisal form for use in evaluating group members in a university level Business Management course.

Groups were instructed and guided through a simulation of the Absolute Judgment format in several steps during two class periods of three hours each (6 hours total). They were told the end product would be a peer evaluation instrument for their own group and possibly for the rest of the groups in that class. After a presentation by the instructor on the use of "knowledge" performance dimensions and measurements used in job evaluations, they were asked to brainstorm and then list preferred knowledge requirements for a high performing group member. These steps were repeated for categories of "skill" and "ability". The lists of performance dimensions were then turned in to the instructor.

Between class period 1 and class period 2, the instructor tallied all the dimensions that were listed by the groups. The list of dimensions and tally of repeats were given to the student groups (see Appendix B). To generate discussion and to review the decisions made the previous class session, the groups were asked to review

the list of performance dimensions and decide which were traits, which were behaviors, and which were outcomes (of attitudes or behaviors). Groups then wrote down three performance dimensions from the list that were most salient to each category, for a total of nine dimensions. There was high agreement between groups on performance dimensions. Student groups were then instructed to determine how the performance dimensions would be measured, and to choose an appropriate scale.

This exercise was the basis of determining what competencies appropriately measure a high or low performing member of a business education group. Since the determination of performance dimensions was an open-ended short answer question, several responses captured the same type of knowledge, skill, or ability. For example, "ability to get along with others", "agreeable", "ability to interact within the group", "listening and understanding", and "people skills", etc. were all collapsed into the competency of *interpersonal skills*. After collapsing similar performance dimensions, six types of competence emerged as highly desirable. Those were communication competency (both oral and written), creativity, technical skills (application skills such as word processing, presentation, spreadsheet), interpersonality, and dependability / attendance. Out of all the attributes suggested, not one student mentioned a demographic trait as desirable or necessary to member performance. Only factors of competency or contribution to the task were suggested.

Reducing Bias and Threats to Validity

The survey is designed to measure respondent's recall of past group events and member relationships, but recording memories can lead to biases or measurement errors. One such bias is the error of omission, where events are forgotten. Another is

the error of “telescoping”, where the respondent remembers the events as occurring in a different time period than they actually did occur. The advantages of recall have been incorporated into the design of the experiment. Those advantages are that people remember important, unusual, or extreme instances. The specific type of recall being measured is the perception of diversity, or what makes one individual think another is most different from others. Therefore, measuring what makes a person memorable appropriately includes the respondent’s errors of omission or telescoping as important factors of perception.

Several steps were taken to reduce bias created by the testing environment and increase survey validity through student honesty. One weakness of the survey method is that it can “temporarily lift the respondent out of their social context” (Kerlinger, 1986, pg. 387), resulting in invalid responses. The higher the difference between normal social context and the context of the survey situation, the more the subject may respond in an unnatural way. For example, a student may respond with how they think the instructor or society believes minorities should be perceived, or how they themselves wish they perceived minorities, rather than the perceptions they actually have. To reduce social context bias the students remained anonymous and were given the survey in the classroom. Their cooperation and response was in the same context (classroom) as the survey topic and was totally voluntary.

To encourage honest responses the student’s anonymity was maintained. Anonymity was also expected to increase response rates. To record responses in a way that the subjects cannot be identified, a number in the lower right corner of the question sheet corresponds to the number coded into the “codes” section of the NCS form. The

researcher can then match open ended and multiple-choice answers while maintaining student anonymity.

Another anticipated bias comes from the fact that those instructors already using the learning group teaching style would also be most interested in administering the survey. To avoid bias due to instructor teaching preferences, the students were instructed to report on a group in a *different*, already completed course. This may or may not be a course in which learning groups were used as a matter of regular instruction. To ensure that students did not select a current group, the survey was administered in the first week of classes. Surveying subjects early in the semester also reduced bias due to the current instructor's teaching methods.

Other steps were taken to reduce researcher bias and students' experience bias. To reduce the possibility of bias from the researcher, Business Strategy faculty from the University of Oklahoma solicited their colleagues in other University settings to administer the survey in capstone courses. This served to remove the researcher and their bias by at least one step from the instructors asked to administer the survey. In addition, the student groups surveyed were further removed from the local environment, which favors use of teams and learning groups. The unit of population of interest is learning groups, so students that have experience in learning groups is necessary. Some level of student experience bias is unavoidable.

Another type of bias has to do with survey design and the bias of response. Research methodology has also addressed the effect of the order in which questions are asked. It is suggested that survey practitioners try to make questions lead from less sensitive to more sensitive areas. The survey design reflects this order. Non-sensitive

questions, such as class name, number of members, hours in class, etc., are at the beginning of the survey. In this politically correct society, questions regarding race, gender, ethnicity, etc. are considered sensitive, and so are close to the last questions asked. A taboo in Northern American society is “tattling”, so the questions which ask a respondent to identify the “Best performing member overall?” and “Least performing member overall?” are last. In addition, the last few questions have been revised from the first pilot study to the last to pursue more detailed response as to areas in which the person was most or least productive.

In placing sensitive questions last, bias of response is decreased. The drawback from placing these questions last is that they will be most likely to suffer if completion rates are low. The last two questions on the survey are not only sensitive, but important to drawing support for our hypotheses. For this reason, a short survey that will lead to increased quality and completeness of response is important.

Method of Measurement

The survey includes questions on visible and immutable personal attributes as well as task behaviors, attitudes and knowledge competency of group members. These questions are used to measure these factors’ saliency in the perception of member performance and learning experience. Using Attribution Theory, the study explores the influence that the nature of the task may have on these perceptions.

The general basis for measurement is members’ personal traits and task-related contributions as recalled by the survey respondent. The general term diversity, as used here, refers to groups in which the actors of interest are not alike with respect to some attribute(s) (Jackson, et al., 1993). As explained earlier, the variations in the

demographic traits of learning groups were measured as levels of personal diversity, while the variations in skills, knowledge, abilities and values were measured as levels of task-related contributions or competencies.

The respondent was asked to record his or her own demographics. Using Social Categorization theory, the study can further test if certain demographic groups perceive themselves in ways that are measurably different than the sample population norm. For example, do those members that choose to rate themselves as “best performer” possess certain demographic traits? Using Social Perception theory the study can examine those group members and/or learning experiences that were rated as *high* or *low*, and correlate which, if any, attributes are most salient in the other member’s perceptions.

Personal Diversity: Method of Measurement

Personal diversity measures included in this study are age, gender, race, language fluency, ethnicity, educational major and class standing. Three of these measures; gender, age, and race, are simply visible and observable personal characteristics. Class Standing is a simple measure of a member's organizational rank. Major is a measure of perceived function. English fluency, which is easily and immediately judged by others, is used primarily as a measure of communication competency, along with ethnicity. Composite measures such as group composition and group size serve as statistical controls.

Respondents were asked to use the survey's codes to best describe the perceived personal attributes of each member for the group they choose to report. They reported on themselves as team member #1, then reported on up to eight total members. Using

an optical response form separate from the survey, respondents recorded the category that best described the member.

Underlying Task-Related Contributions: Method of Measurement

Task-related competency measures included communication skills, knowledge, creativity, interpersonal skills, technical skills, and dependability/attendance. After describing their and each member's personal traits, respondents were asked to place the number of the person that was the best fit or the worst fit in each task competency description. For example, respondents recorded which team member best fit the description 'most creative', and which team-member best fit the description 'least creative'. Respondents were asked to rank the group member that was highest and lowest on all task competency measures by marking directly onto the survey. The scantron and survey form were later matched using codes previously placed on both forms.

Mediating Variable –Task Interdependence: Method of Measurement

Feichtner and Davis' (1985) report and Johnsons' (1975, 1981, 1982, 1983) series of studies imply that an interactive task is vital to a positive group experience. In contrast, a task that can be divided, such as a written report, a series of case studies, or class presentations may lead to a negative group experience. To measure the impact of diversity on task, the students describe themselves and other group members demographically, then rate the members according to their group contribution. Chi-square statistics will be used to determine if the samples between institutions differ on

gender and racial minority/non-minority status for the aggregate control measure of group heterogeneity.

Two survey items dealt with whether the task was independent or interdependent. In addition, respondents were asked to fill in how many common group assignments their group was asked to complete. Using Wood's typology, the type of task is categorized as interdependent or independent. The experiment can measure the mediating effect, if any, of the type of task on the ratings of group members when controlling for diversity of those members.

Dependent Variables: Reliability of the Measures

Three items were used to measure perceived learning effectiveness of groups. All three used a five point scale with '1' being lowest and '5' being highest. One question asked "On a scale of 1 (complete waste of time) to 5 (extremely valuable learning experience), what is your **overall** assessment of the group work in the class? The other two asked students to evaluate the group experience in terms of overall effectiveness when responding to "to what extent did this experience enhance the learning of class material?" and "to what extent did this experience enhance your overall collegiate education?" Cronbach's Coefficient Alpha will be used to assess the reliability of these measures singly and as a mean aggregate. Since it is perceptions, not objective measures, that are the dependent variable, a decision made by a respondent regarding another member's performance evaluation is valid.

A summary table of the hypotheses and conjectures, variables measured and statistical tests are presented in Appendix C, Summary of Statistical Tests and Proxies.

In addition, Appendix A2: Survey Questions with Variable Names, can be used to guide the reader through items and measures.

Statistical Procedures

Overall descriptive statistics of the sample population include means and standard deviations of all personal demographics such as gender, age, race, ethnicity, English Fluency, Major, and Class standing. Control variables such as group size and group tenure will be determined through mean, median and standard deviation, while group heterogeneity will be determined by the coefficient of variation (using personal traits).

Checks for content validity were built into the survey, by using redundant data for group size, member's class standing, and types of tasks reported. This redundancy also gives a measure of percept/percept inflation. Students are asked information at the beginning of the survey, then report again on those variables closer to the end of the survey.

The data will be divided into two samples - surveys of positive learning experience and surveys of negative learning experience. The variables for surface level personal attributes will then be cross-correlated with variables for underlying task competencies to determine convergence on constructs. If there is strong collinearity among two variables, one may be dropped in favor of the variable with the most explanatory power.

To determine the relationship between group outcomes and the nature of the task this study plans to use regression analysis. For example, the question of Hypothesis 1 is whether personal trait diversity becomes less important and underlying task-related

contributions more important in evaluating group learning effectiveness when the task is interactive. To test this hypothesis, we plan to regress a diversity score of each independent variable (at the individual-in-a-group level of unit) with learning effectiveness as the dependent variable. Both personal trait and task competency variables as well as control variables (such as group size or group tenure) will be tested. The study expects to use a significance level of $p < .10$. This same regression will be repeated for the second hypothesis, which tests interaction of task with the dependent variable of member performance. Finally, the possibility of other explanations for task's impact will be explored.

Summary

By implication, this dissertation study examines the intervening role that information gathering and exchange may play in evaluating learning group effectiveness and learning group performance. Tasks that naturally encourage the gathering of information about members are expected to have a positive correlation to member characterization, which will in turn affect performance evaluation on both group and individual levels.

Analysis: Statistical Tests using dummy variables

In this particular study, two different types of independent variables are used. Surface trait variables are categories of gender, race, etc., which makes them qualitative measures. Task competency variables are ordinal ratings of 0 (Worst) to 1 (Best), making them quantitative measures (.5 is neutral). The mediating variable, 'tasks', is a categorical variable with those groups whose tasks averaged below the sample's score

determined to be independent in nature and those above the average as interactive. Both dependent variables are quantitative. The dependent variable that measures perception of the learning value of group work is an average of three survey questions. These three questions scored elements of the learning experience ranging from 1 (low) to 5 (high). The other dependent variable - perception of a team member's performance - is rated from 0 (Worst) to 1 (Best), with .5 being a neutral value (given to members not rated).

Surface Traits measured as dummy variables

The personal traits of gender, age, race, ethnicity, English fluency, major and class standing were captured as categorical variables that are qualitative in nature. Hypotheses and conjectures assume that these qualitative variables influence the dependent variable and will have an important role in explaining the degree of task importance. For example, holding all other factors constant, black students are expected to be perceived less favorably than whites, and females are expected to be perceived less favorably than males. This pattern may result from racial or gender discrimination, but whatever the reason, qualitative variables such as race and gender do influence the dependent variable and must be included in any regression used to explain variance in student's perceptions.

Since such qualitative variables indicate the presence or absence of an attribute, such as male or female, black or white, old or young, we chose to "quantify" such attributes by constructing artificial variables that take on values of 1 or 0. The value 0 indicates the absence of an attribute and 1 indicates the presence of an attribute. Commonly the higher value, 1, is given to the attribute that is expected to be perceived

as more positive. For example, 1 will indicate that a group member is male, while 0 will designate a member as female. Also called dummy variables, these categorical qualitative variables can now be used in regression models just as easily as quantitative variables (Kerlinger, 1986; page 36).

Dummy coding each category of all the personal trait variables would result in a possible total of 27 personal attributes. In the interest of parsimony, most of these categories were reduced to 1 or 2 dummy variables as described below. The final result was 9 dummy variables used to quantify 7 qualitative categories.

Gender

As already described, a group member's gender is naturally of 2 classes, either male or female. The dummy variable for gender is 'sex'; where '1' corresponds to male members, and a '0' equals all non-male members, or females.

Age

Age as a task trait was originally grouped into 5 categories that were intended to focus on the traditional college student's age. These categories clustered ages 17-20, 21-25, 26-30, 31-35, and all ages over 36. Since two clusters (age 17-25) best captures the age of a traditional student that enters college immediately after high school, we will call the first dummy variable 'age1' and give the value '1' to any member in those two age categories. We expect most students to fall into this category, and to perceive other members more favorably when in that category. If the student is a '0', then we see if they fit into the dummy variable 'age2', which designates a '1' for any student categorized as age 26-30. This group member is older, but can still easily relate to and

be accepted by their younger group peers. If a member is a '0' for both of these dummy variables (age1 and age2) then we know they are 36 or over by default.

Race

Race as a personal trait was originally grouped into 5 categories: White, Black, Hispanic, Asian, and American Indian. Although many individuals are a mixture of a number of races, the variable of interest is *perception* of race. As explained in Chapter Two, most people use stereotyping to place a group member into a single category. Even in the United States "melting pot", these categories often are reduced to White, Black, and Other. The dummy variable 'race1' gives a '1' to all white members, and a '0' to all other race categories, or 'nonwhite'. The dummy variable 'race2' gives a '1' to all black members, and a '0' to any non-black members. By default, all other members that do not have a '1' in race1 or race2 are "other". They are not perceived as White or Black, but as Hispanic, Asian, or American Indian.

Ethnicity

Most people stereotype ethnicity in a way similar to race. In the case of ethnicity, the perception may be even more dichotomous. A member is either perceived as "one of us", or "a foreign student". Since all the surveys were given on the American continent, the dummy variable 'ethnic' will value all members that are "American" as '1' and all non-Americans, or perceived foreigners, as '0'.

English fluency

Language fluency is being treated in the same way as ethnicity. All members who are fluent or better will be given a '1' for the dummy variable 'English'. All

members whose language skills are understandable or worse will be given a '0' for the dummy variable 'English'. Using only one dummy variable implies that a simple accent can damage a student's perceived fluency. This study may show that perceptions are not so grossly made, but stereotyping implies that any difference in language will be considered as 'less fluent'.

Major

To summarize the impact of a student's major on task and perceptions, the categories were split along lines of "technical" and "behavioral". Although all business majors include both quantitative and behavioral skills and knowledge, some emphasize one element more than others do. It is highly probable that Finance majors may be perceived as more "technical" due to their quantitative skills than Marketing majors. Majors that are generally believed to be more quantitative include Accounting, Finance, MIS, and Productions/Operations Mgmt. For these reasons, categories 'A' (Acct/Finc) and 'C' (MIS/POM) were given the value '1' in dummy variable Major. Behaviorally based majors such as management and marketing were included with "other bus." and "non-business", and were given a '0' for dummy variable Major.

Class Standing

Class standing was easily reduced to the dummy variable 'class' measuring upper classmen and lower classmen. Junior and Senior classmen were given a '1' for dummy variable 'class', while Freshman and Sophomores were given a '0' for 'class'. Only undergraduate students were surveyed, so no other categories or dummy variables are needed.

Task Competencies measured as quantitative variables

After describing the personal attributes of each member (see traits above) the respondent was asked to write down the member that was perceived as 'Best' (or 'Most') and 'Worst' (or 'Least') for six types of task competency: communication, knowledge, creativity, technical skills, interpersonal skills, and dependability. These responses are translated into quantitative values whereby '1' corresponds to the 'good' perceptions of 'Best' and 'Most', and '0' corresponds to perceptions of 'Worst' and 'Least'. If a member was not listed, they were given the neutral value of '0.5'. Although any range of values could be used, i.e.: 1-5, 2-7, etc., the range between 0 and 1 matches that of personal task traits' dummy variables' range and is preferred. In this way, every group member reported has a task trait value - high, neutral, or low.

Measuring the Interactivity of the Task

The task's interactivity was measured using the sum of three survey items measuring time spent face-to-face. The sum of hours spent face to face ranged from 0 hours per group to 241.67 hours per group with an average mean of 57.85. Based on Wood's typology, the nature of the task was rated as interactive or independent. Values up to 57.85 are categorized as group tasks that are independent in nature and values over 57.85 are categorized as group tasks that are interdependent. Reviewing Wood's task typology (1986), those tasks that are highly interactive are complex and require integration of information cues, acts, and products. In other words, group members must share information with each other, cooperate in their actions, and come to consensus on the final product. Those tasks that are completely independent are simple,

and the information cues, acts, and products can be split between group members or be done by one member alone.

Statistical Models for testing hypotheses

After grouping each response into task categories of 'interactive' or 'independent' we can test the assumption of null hypothesis one, which states "Interactive tasks have no impact on perceptions of another member's contribution to group performance".

Using responses from the interactive task category, a test that there is no personal trait discrimination can be made by running regression in the usual manner and finding out whether on the basis of the t test if the estimated β (Beta) is statistically significant. If β (Beta) is statistically significant, the results indicate that the mean perceptions of categories are different. In addition, by holding all other variables constant, we may see for each unit change in our independent variables what the probability is for a change in perception of a member's performance. For example, for each unit change in race (White, Black, or Other), what is the change in probability that the member will be deemed "Best overall"? The same type of regression, run for those responses from the "independent task" category, can be compared in a similar way. In this way, the impact of each personal or task trait can be compared against means of perceptions of group members when using interactive tasks vs. independent tasks.

Model for Testing Null Hypothesis 1

Hypothesis 1: Interactive tasks have no impact on *perceptions of learning effectiveness in groups*

$$LEib = \alpha_1 + \alpha_2 \text{sex} + \alpha_3 \text{Age1} + \alpha_4 \text{Age2} + \alpha_5 \text{Race1} + \alpha_6 \text{Race2} + \alpha_7 \text{Ethnic} + \alpha_8 \text{English} + \alpha_9 \text{Major} + \alpha_{10} \text{Class} + \beta X_1 + \beta X_2 + \beta X_3 + \beta X_4 + \beta X_5 + \beta X_6$$

Where LEib = respondent's perception of group learning experience when using an interactive task

X1 = rating of task skill for communication

X2 = rating of task knowledge through content or experience

X3 = rating of task ability for creativity

X4 = rating of task technical skills

X5 = rating of task skill for interpersonal ability

X6 = rating of task competence for dependability or attendance

Sex = 1 if male

= 0 otherwise (female)

Age1 = 1 if 17-25

= 0 if otherwise

Age2 = 1 if 26-30

= 0 if otherwise

Race1 = 1 if White

= 0 if otherwise

Race2 = 1 if Black

= 0 Hispanic, Asian, or American Indian

Ethnic = 1 if American

= 0 if otherwise

English = 1 if fluent

= 0 if otherwise

Major1 = 1 if Acct/Finc or MIS/POM

= 0 if otherwise

Class = 1 if Upper classmen (Junior or Senior)

= 0 if otherwise

Model for Testing Null Hypothesis 2

Hypothesis 2: Interactive tasks have no impact on perceptions of *another member's contribution to group performance*

$$\text{MPib} = \alpha_1 + \alpha_2 \text{sex} + \alpha_3 \text{Age1} + \alpha_4 \text{Age2} + \alpha_5 \text{Race1} + \alpha_6 \text{Race2} + \alpha_7 \text{Ethnic} + \alpha_8 \text{English} + \alpha_9 \text{Major} + \alpha_{10} \text{Class} + \beta X_1 + \beta X_2 + \beta X_3 + \beta X_4 + \beta X_5 + \beta X_6$$

Where MPib = perception of a group member when using an interactive task

X1 = rating of task skill5 for communication

X2 = rating of task knowledge through content or experience

X3 = rating of task ability for creativity

X4 = rating of task technical skills

X5 = rating of task skill for interpersonal ability

X6 = rating of task competence for dependability or attendance

Sex = 1 if male

= 0 if otherwise (female)

Age1 = 1 if 17-25

= 0 if otherwise

Age2 = 1 if 26-30

= 0 if otherwise

Race1 = 1 if White

= 0 if otherwise

Race2 = 1 if Black

= 0 if Hispanic, Asian, or American Indian

Ethnic = 1 if American

= 0 if otherwise

English = 1 if fluent

= 0 if otherwise

Major1 = 1 if Acct/Finc or MIS/POM

= 0 if otherwise

Class = 1 if Upper classmen (Junior or Senior)

= 0 if otherwise

These models have 6 quantitative explanatory variables and 9 qualitative variables.

Chapter Four: Statistical Analysis

Introduction:

The goals of this study are to determine the group assignment's influence on attributions toward the learning situation and other members. The focus of the study was on a member's personal traits and task competency in small group learning environments. Learning groups were split into two subsamples – those whose learning experience was positive, and those whose learning experience was negative.

Statistical tests of the extent and impact of missing data were evaluated. Cronbach's coefficient alpha was calculated to assess the reliability of the composite measures used in the study. Correlation between subjects' personal traits was assessed using Spearman's Rho and Kendall's Tau-B coefficients. Correlation diagnostics and canonical correlation was used to assess the independence of personal dispersion and variables that measured members' task abilities. Linear regression is used to assess the extent to which respondents' perceptions regarding their own learning experience was affected by personal or task abilities when the task was interdependent rather than independent. Logistic regression is used to evaluate the impact of the mediating variable 'task' on perceptions of other group members. T-test, F and chi-square statistics are used to measure the probability of significance.

Sample Characteristics

The sample consisted of 822 subjects. The survey was randomly administered so 50% of respondents would report on their most positive learning group experience, and the other 50% report on their least positive learning group experience. Of the

completed and returned surveys, 420 were "Least Positive" surveys and 402 were "Most Positive". This ratio of 51% (Least Positive surveys) to 49% (Most Positive surveys) is acceptably close to the desired 50/50 ratio. Approximately 9-11% of the surveys were not completed. Most of the drop in responses began near the end of the survey when describing other group members.

Student Characteristics

Descriptive statistics and frequency tables were calculated to evaluate the demographic differences among the subjects in the sample. Correlations of all personal traits were measured using Spearman's coefficients. Crosstabulation tables using Kendall's Tau-C and Gamma statistics were used to determine if the institutions in the study differed according to gender, age, race, ethnicity, English fluency, college major, or class standing.

Frequency Statistics of Personal Traits

The ratio of male (53%) to female (47%) subjects was surprisingly even, perhaps reflecting the increasing influx of females into both higher education and business. Seventy-three subjects did not complete gender information or gave erroneous responses. Of the 754 remaining subjects there were 396 males and 353 females. Gender information is summarized in Table 4.1.

As expected, the sample mainly consisted of traditional college students. The majority of subjects (57%) were between the ages of 21 and 25. Another 24% were between the ages of 17 and 20. Of the 743 valid responses, 95% were aged 30 or under at the time they were a member of the reported group. Student age information is

summarized in Table 4.2. Of those that responded, 20.5% would be considered a racial minority and 13.6% reported themselves as non-American. Summary information of race and ethnicity can be found in Tables 4.3 and 4.4, respectively. From the 19.6% of students whose native tongue wasn't English, 17.9% reported that they were fluent or understandable to other English speaking persons (see Table 4.5). Only 1.7% of 738 respondents reported a lack of language fluency. Almost all the students were business majors (99.3%) and most students were reporting on groups they experienced as a Junior or Senior (81%). College major and class standing information are summarized in Tables 4.6 and Table 4.7. The standard respondent was a White American under 30 years of age that spoke English as a native tongue and was a Junior or Senior Business major.

Table 4.1

Gender of Subjects

Gender	Frequency	Percentage	Valid Percent
Male	396	48.2	52.8
Female	353	42.9	47.2
Missing	73	8.9	
Total	822	100%	100%

Table 4.2

Age of Subjects

Age	Frequency	Percentage	Valid Percent
21-25	465	56.6	62.3
17-20	195	23.7	26.2
26-30	48	5.8	6.5
36 or over	19	2.3	2.6
31-35	16	1.9	2.2
Missing	79	9.6	
Total	822	100%	100%

Table 4.3

Race of Subjects

Race	Frequency	Percentage	Valid Percent
White	572	69.6	77.3
Black	73	8.9	9.9
Asian	60	7.3	8.1
American Indian	21	2.6	2.8
Hispanic	14	1.7	1.9
Missing	82	10.0	
Total	822	100%	100%

Table 4.4

Ethnicity of Subjects

Ethnicity	Frequency	Percent	Valid Percent
American	626	76.2	86.5
Asian	54	6.6	7.5
European	28	3.4	3.9
African	10	1.2	1.4
Middle East	6	.7	.8
Missing	98	11.9	
Total	822	100%	100%

Table 4.5

English Fluency of Subjects

English Fluency	Frequency	Percentage	Valid Percent
Native tongue	593	72.1	80.4
Very Fluent	99	12.0	13.4
Understandable	33	4.0	4.5
Hard to understand	9	1.1	1.2
Very low English skills	4	.5	.5
Missing	84	10.2	
Total	822	100%	100%

Table 4.6

Major of Subjects

Major	Frequency	Percentage	Valid Percent
Mgmt/Mkt	198	24.1	27.3
Acct/Finance	189	23.0	26.1
Mis/POM	178	21.7	24.6
Other Business	154	18.7	21.3
Non-Business	5	.6	.7
Missing	98	11.9	
Total	822	100%	100%

Table 4.7

Class of Subjects

Class	Frequency	Percentage	Valid Percent
Freshman	43	5.2	5.9
Sophomore	95	11.6	13.1
Junior	256	31.1	35.3
Senior	331	40.3	45.7
Missing	97	11.8	
Total	822	100%	100%

Correlation of Personal Traits

If a certain level of correlation is found among independent variables, a linear dependency and therefore a bias in the findings is likely. Correlations of the students' gender, age, race, ethnicity, English fluency, major and class standing were analyzed using Spearman's Rho coefficient and Kendall's Tau-B coefficient. Both types of coefficients were in close agreement on significance. Race and Ethnicity were moderately correlated, as were English Fluency and Ethnicity. English Fluency and Race also correlated, but not as highly. These three variables have a danger of collinearity, which can bias regression. The other two variables that showed some correlation were Age and Class. Table 4.8 summarizes the coefficients, significance levels, and n for the correlated variables, as well as showing the full correlation matrix. Further tests of possible bias were conducted and exhibited in Appendix E: Tests of Correlation. No danger of bias due to correlation of personal trait variables was found.

Table 4.8

Summary of Correlation Analysis

Correlating Var.s	Coefficient	Significance	# of Obs.
Race/Ethnicity	Spearman's = .52166	$p=.0001$	720
	Kendall's = .48988	$p=.0001$	
Ethnicity/English	Spearman's = .50786	$p=.0001$	719
	Kendall's = .48603	$p=.0001$	
Race/English	Spearman's = .34747	$p=.0001$	733
	Kendall's = .32644	$p=.0001$	
Class/Age	Spearman's = .49072	$p=.0001$	722
	Kendall's = .44607	$p=.0001$	

Spearman Correlation Coefficient Matrix *

	Gender	Age	Race	Ethnicity	English	Major	Class
Gender	1.000 0.000 749						
Age	-0.092 0.013 738	1.000 0.000 743					
Race	0.049 0.183 735	0.124 0.001 739	1.000 0.000 740				
Ethnicity	0.067 0.073 719	0.107 0.004 722	0.522 0.000 720	1.000 0.000 724			
English	0.134 0.000 733	-0.084 0.023 736	0.347 0.000 733	0.508 0.000 719	1.000 0.000 738		
Major	0.039 0.292 719	-0.073 0.051 723	-0.065 0.080 719	0.050 0.184 707	0.209 0.000 724	1.000 0.000 724	
Class	-0.054 0.150 721	0.491 0.000 722	0.099 0.008 719	0.014 0.717 705	-0.189 0.000 723	-0.121 0.001 710	1.000 0.000 725

*Spearman Correlation Coefficients

Prob > |R| under Ho:Rho=0

Number of Observations

Kendall tau b Correlation Coefficient Matrix *

	Gender	Age	Race	Ethnicity	English	Major	Class
Gender	1.000 0.000 749						
Age	-0.088 0.013 738	1.000 0.000 743					
Race	0.047 0.182 735	0.115 0.001 739	1.000 0.000 740				
Ethnicity	0.066 0.073 719	0.100 0.004 722	0.490 0.000 720	1.000 0.000 724			
English	0.131 0.000 733	-0.080 0.021 736	0.326 0.000 733	0.486 0.000 719	1.000 0.000 738		
Major	0.036 0.292 719	-0.063 0.052 723	-0.058 0.079 719	0.044 0.193 707	0.186 0.000 724	1.000 0.000 724	
Class	-0.051 0.150 721	0.446 0.000 722	0.090 0.008 719	0.013 0.718 705	-0.175 0.000 723	-0.103 0.001 710	1.000 0.000 725

* Kendall Tau b Correlation Coefficients

Prob > |R| under Ho:Rho=0

Number of Observations

Institutional Data

This sample consisted of subsets from institutions of higher education in the United States and Canada. The following section explores the distribution of responses by subset institution. Institutions were further explored for differences between subjects on personal traits and on group control variables and for levels of heteroskedasticity in Appendix D: Tests of Heteroskedasticity.

Institutional Frequency Distributions

Due to convenience of sampling, a large proportion of student responses came from the University of Oklahoma (39.3%) and over 56% of all responses came from Oklahoma institutions. Almost 86% of all surveys were from United States institutions of higher education; the remaining surveys were from Canadian respondents. See Table 4.9 for a summary of institutional response rates.

Table 4.9

Response Rates by Institution

Institution	Response #	Percent	Cum. %
University of Oklahoma	323	39.3	39.3
Oklahoma State University	77	9.4	48.7
Northeastern State University (Oklahoma)	64	7.8	56.5
Millsaps College (Mississippi)	41	5.0	61.5
Radford University (Virginia)	74	9.0	70.5
Florida State University	29	3.5	74.0
Morgan State University (Maryland)	61	7.4	81.4
University of Wisconsin	36	4.4	85.8
St. Mary's University (Halifax)	38	4.6	90.4
St. John's University (New Brunswick)	79	9.6	100.0%
Total	822	100.0%	

Level of Analysis

This study is based on theories that use measures of race and ethnicity diversity for *social perception* and *social categorization within learning groups*. If this study were measuring only diversity among institutions, a transformation of race and ethnicity error terms would be appropriate. In this case, transformation is inappropriate. For these theories a more accurate subset than the institution is the group and a more accurate focus is the group's composition. The level of analysis is the individual within the group, rather than the individual within the institution or within the sample population.

For example, a Black American within a predominately White American group would have a high level of individual racial diversity when compared to the group's composition. It is possible that the Black individual's race was a major factor in how others in the group categorize the Black member's competence. It is also possible that a Black individual will perceive another group member's contributions differently than a White member who is judging the same group member. In a different scenario, a Black American in a predominately Black American group has a very low level of racial or ethnic diversity when compared to group composition. Social categorization and social perception theories suggest fairly consistent judgments of other's competence among individuals in homogeneous groups - even if the group is comprised of racial minorities.

Missing Data

Of the 822 surveys received, 73 students chose not to fill out the psychometric matrix that described their own and their group member's demographic data, affecting 9% of the total sample. Due to random selection and attrition, not all independent variables were evenly matched on reports of most positive experience vs. least positive. For example, males reported on their least positive group experience more than females. The crosstabulation table of all personal traits by report type showed that most categories had insignificant differences on proportion of least to most positive reports. See Table D.8 at the end of Appendix D for the crosstabulation of respondent's gender (the first question of the demographic matrix used to ask group member personal traits) to report type.

Missing data also occurred as a result of students that chose not to answer the more sensitive questions concerning member task competence. These questions came

after the demographic data matrix. Some answered questions that pertained to positive judgments but not negative judgments, while some chose not to answer this section at all. On average, survey completion rate dropped to 81% for questions regarding task competence and 77% for task incompetence. Pairing each positive measure of task ability to its negative alternative, a T-test showed no significant difference between average completion rates (See Table D.9 at the end of Appendix D). The last and most sensitive two questions asked students to choose a "best member overall" and a "worst member overall". Of those students that began the survey, 80% made a choice as to best member and 75% chose a worst member. The total of surveys completed was 617.

Occasionally, students skipped an item or responded to a question incorrectly. When it was apparent that the student marked the answer form wrong or did not understand the question, their response to that particular question was excluded from the database. Few errors of this nature occurred, and primarily affected dichotomous questions such as member's gender or if more than one group was used in the class.

To take advantage of all the information available, none of the original 822 surveys were excluded from the database. The entire data set was included for correlation and discriminant analyses, so the number of observations used in different statistical tests may vary.

Constructs: Type of Variables and Value range

In this particular study, two different types of independent variables are used. Personal trait variables are categories of gender, age, race, etc., which makes them qualitative measures. Age, race, ethnicity, and major are measures of demographic characteristics that hold no particular value. English fluency and Class standing are

scores that are based on a linear scale, such as high fluency (Native tongue) to low fluency (not understandable) and high class standing (senior) to low class standing (freshman). From these categories, a dispersion score (d_score) that measures the student's amount of diversity when compared to the rest of the group is produced. These d_scores are quantitative measures of a student's personal diversity for each trait.

Variables measuring task competency and contributions are rated from 0 (Worst/Least) to 1 (Best/Most), making them quantitative measures (.5 is neutral). Because these task variables are value judgments with only one member of the group getting the high score (1) or low score (0), the member's competency as compared to their group is already assigned, and a dispersion score is not needed. All students not rated as best or worst are given the neutral score of 0.5, meaning that they were not particularly diverse (high or low) on that particular task measure.

The mediating variable, task interactivity, is a composite measure of the sum of 3 survey items where the respondent filled in the number of hours spent as a group. Both dependent variables are quantitative. The dependent variable that measures perception of the learning value of group work is an average of three survey questions. These three questions scored elements of the learning experience ranging from 1 (low) to 5 (high). The other dependent variable - perception of a team member's performance - is rated from 0 (Worst) to 1 (Best), with .5 being a neutral value (given to members not rated).

Personal Traits Measured as quantitative D_scores

Attributions of personal traits for this study were measured using Tsui, Egan and O'Reilly's (1992) dispersion index, or distance score (D_score). For example, d_age is

an individual's level of age diversity when compared to their group, while D_{class} is the difference score for an individual's level of diversity when compared to their group on the variable "class standing". The rest of the d_{scores} are similarly named to match the personal variables already described. The new measures of personal trait variables are d_{gender} (gender), d_{age} (age), d_{race} (race), d_{ethnic} (ethnicity), d_{fluent} (fluency), d_{major} (business major), and d_{class} (class standing).

As mentioned earlier in this study, the level of analysis of the independent variables being measured is the individual within a group. Many other studies have used a Euclidean distance formula to operationalize the difference (or similarity) between an individual's demographic trait and the demographic composition of their group (Jackson, Sessa, Cooper, Julin & Peronnin, 1991; O'Reilly et al., 1989; Tsui, Egan, & O'Reilly, 1992; Tsui & O'Reilly, 1989; Wagner, Pfeffer, & O'Reilly, 1984; Zenger & Lawrence, 1989). Over the course of these studies the dispersion index has been slightly modified to its present form, which is used by this study. These studies reported consistent and significant results, although the effect sizes of differences between members in terms of a select demographic trait have been small (Lau & Murnighan, 1998). Based on these studies, the score of diversity, or dispersion index formula is:

$$D_{Score} = (1/n) \sum [(s_i - s_j)^2]^{1/2}.$$

The demographic trait "race" and "ethnicity" had subgroups with few observations, which led to a small effect size for each select subgroup within those categories (Lau & Murnighan, 1998). In this study, the number of observations for any race other than "White" was small, so the personal trait "race" was collapsed into two

subgroups, White (race = 1) and Non-white (race = 0). This also corrected the problems of using a distance score for races other than White that had arbitrary values assigned. For example, a triad with one White, one Black, and one Hispanic student will produce a d_race score for all three students as 0.578. The personal trait of “ethnicity” was similarly collapsed into “American” and “Non-American” subgroups for the dispersion score “d_ethnic”.

The personal trait “Major” also used arbitrary codes and values, and was fairly evenly split among four business disciplines. Regression and correlation showed “Major” as having little impact, so this variable was dropped and no d_score was computed.

Task contribution measured as a quantitative variable

After describing the personal attributes of each member (see sample survey) the respondent was asked to write down the member that was perceived as 'Best' (or 'Most') and 'Worst' (or 'Least') for six types of task competence or contribution: communication, knowledge, creativity, technical skills, interpersonal skills, and dependability. These responses are translated into polychotomous ordinal variables with quantitative values whereby '1' corresponds to the 'good' perceptions of 'Best' and 'Most', and '0' corresponds to perceptions of 'Worst' and 'Least'. If a member was not listed, they were given the neutral value of '0.5'. Using this strategy, every group member reported has a value for every task measure - high, neutral, or low.

All of the task variables have close descriptive statistical values, due to the fact that the task measures are polychotomous in nature with only 3 possible values and a limited range of 0 to 1. Since the observer is evaluating their own task level and

abilities, there was a strong probability that the scores would be skewed towards the high end (towards 1). Although the means show that people do on the average evaluate themselves higher, the lowest mean of all task competency measures is 0.5870 (for the task variable of creativity) and the high mean is 0.6559 (for interpersonal skills). Since the statistical mean would be 0.5 if it was unbiased, the deviation is not as serious as it could be. The mean, standard deviation, values range and skewness for each independent variable is summarized in Table 4.10 below.

Table 4.10

Independent Variables: Descriptive Statistics *

Variable	Mean	Std Dev	Minimum	Maximum	Skewness
D_GENDER	0.50	0.29	0.00	0.91	-0.79
D_AGE	0.49	0.61	0.00	2.95	1.40
D_RACE	0.28	0.32	0.00	0.93	0.50
D_FLUENT	0.44	0.62	0.00	3.46	1.44
D_ETHNIC	0.22	0.31	0.00	0.93	0.86
D_CLASS	0.40	0.49	0.00	2.69	1.39
COMMUNIC	0.64	0.31	0.00	1.00	-0.22
KNOWLEDG	0.60	0.28	0.00	1.00	0.05
CREATIVE	0.59	0.30	0.00	1.00	-0.08
TECHNICL	0.60	0.30	0.00	1.00	-0.09
INTRPSNL	0.66	0.29	0.00	1.00	-0.14
DEPENDBL	0.63	0.27	0.00	1.00	0.06

* N=632

Tests of Collinearity

If any correlation is found among independent variables, a linear dependency and therefore a bias in the findings is likely. A potentially harmful collinear relationship is indicated when a correlation coefficient between two explanatory variables is greater than 0.8 or 0.9 (Griffiths, et. al, 1993, page 435).

The pretest to this study provided a sample that was tested using similar variables. High correlation among the variables ethnicity, race, English fluency and communication skills were found. It is possible the multicollinearity of these variables strongly biased their predictive strength for the dependent variable "best member overall" or "worst member overall". Since it was likely this study's sample would also have collinear variables, and that d_scores of those variables would similarly covary, a thorough diagnosis of multicollinearity was warranted. The issue of multicollinearity is addressed in Appendix E using diagnostic tests of condition indices and variance inflation factors, as well as correlation coefficient and canonical correlation analysis of independent variables. These tests found no statistical threat of bias due to multicollinearity.

Measuring the Interdependence of the Task

The nature of the task was rated as interdependent or independent. Reviewing Wood's (1986) task typology from Chapter Two, those tasks that are highly interdependent are complex and require integration of information cues, acts, and products. In other words, group members must share information with each other, cooperate in their actions, and come to consensus on the final product. Those tasks that are completely independent are simple, and the information cues, acts, and products can be split between group members or be done by one member alone.

To engage in the sharing, cooperation, and consensus of an interdependent task implies spending time communicating as a group. Three open ended quantitative items capture the time spent between members face to face, both in and out of class. It is during this time together that interdependent group processes can take place. A sum of

all three items is used to measure task interactivity. The sum of hours spent face to face ranged from 0 hours per group to 241.67 hours per group with an average mean of 57.85. Values up to 57.85 are categorized as group tasks that are independent in nature and values over 57.85 are categorized as group tasks that are interdependent. The reliability of this measure is detailed later in this chapter (see Table 4.12).

Reliability of Measures

Group Learning Effectiveness

The construct of "group learning effectiveness" was measured using the average of three questionnaire items whose scale ranged from 1 to 5. The first item asked, "On a scale of 1 (complete waste of time) to 5 (extremely valuable learning experience) what is your overall assessment of the group work in the class?" Some students chose not to answer, reducing the n to 793. In a later section of the survey a second question asked, "To what extent did the group experience enhance the learning of class material?" This question had a higher completion rate, with 812 valid observations. The third item directly followed this question on the survey and asked, "To what extent did the group experience enhance your overall collegiate education?" This item had 808 valid observations. The individual items were compared to see if subjects with missing data differed on demographic traits such as gender, race, or age. No significant differences were found, although women and whites tended to have missing data more than males and minorities.

Cronbach's coefficient alpha was used to test the reliability of the 3 items measuring group learning effectiveness. All the items demonstrated adequate

reliability. The three items showed inter-item correlation ($\mu=.68$) with a standardized alpha of 0.86 ($n=782$). Table 4.11 shows the reliability for each item.

Table 4.11

Reliability of Multi-Item Group Learning Effectiveness Measure*

Item	Mean	Std Dev.
What is your overall assessment of group work?	3.19	1.18
Did the group experience enhance the learning of class material?	3.06	1.27
Did the group experience enhance your overall collegiate education?	2.83	1.27

* $n=782$

Measure of Task Interactivity

The construct of "task interactivity" was measured using the sum of three open-ended quantitative questionnaire items designed to capture face-to-face interaction. The first item asked, "How many hours in class did you spend working as a group over the entire semester?" (It is assumed that time spent in a group during class would be face-to-face.) There were 713 valid responses to this question, with responses ranging from 0 to 240 hours (the capstone MIS course at University of Oklahoma had a few responses of groups meeting over 200 hours). Immediately following this item a second question asked, "What was the total number of hours you spent on group projects or assignments outside of class during the semester?" This item generated 710 responses, with responses ranging from 0 to 300 hours. Although this question did not specify face-to-face meeting in groups, it was sandwiched between 2 questions that did measure face-to-face meetings and correlated highly with the other 2 questions (especially the 3rd question that specified hours spent face-to-face) (see table 4.12). The third item directly

followed this question on the survey and asked, "Of the time spent on group projects or assignments, how many hours did you spend in a face-to-face setting?" The last item had 708 valid responses with responses ranging from 0 to 275 hours.

Cronbach's coefficient alpha was used to test the reliability of the 3 items measuring task interactivity. This composite measure demonstrated adequate reliability. The three items showed inter-item correlation ($\mu=.59$) with a standardized alpha of 0.81 ($n=758$). Although two items (Hours face-to-face and Hours out of class) had a higher standardized alpha than all three items, a 3 item measure is much stronger and higher validity. Table 4.12 shows the reliability statistics for each item.

Table 4.12

Reliability of Multi-Item Task Interactivity Measure*

Item	Mean	Std Dev.
How many hours in class did you spend working as a group over the entire semester?	11.63	24.33
What was the total number of hours you spent on group projects or assignments outside of class during the semester?	25.77	28.99
Of the time spent on group projects or assignments, how many hours did you spend in a face-to-face setting?"	19.60	24.51
Reliability Coefficient		Standardized Alpha
Hours in Class & Hours Face-to-Face		0.76
Hours out of Class & Hours Face-to-Face		0.85
Hours in class, hours out of class, & Hours Face-to-face		0.81

* $n=758$

Measure of Member Performance

The construct of 'member performance' is measured by two items. At the very end of the survey, the respondent was asked to insert the number of the group member that was "Best performing member overall" and "Worst performing member overall". These two items are straightforward questions and have strong face validity. Since these two questions would give only two members of the group a 'performance' score all other members are assigned a neutral score of 0.5. The measure of member performance is therefore a polychotomous ordinal value with 3 categories of 'best' (1), 'neutral' (0.5) and 'worst' (0).

To measure null hypothesis two (how the personal diversity of *another* member will affect the respondent's perception of *another* member's overall performance) two methods and two different populations were used. First, to measure a different member's performance, each member being reported became a single observation for the hypotheses testing perceptions of another member's performance, and the study deleted all observations where the respondent rated himself or herself as best or worst. Not surprisingly, 32.4 percent of the valid responses felt they were the best performing member. A few honest souls – 5.3%, rated themselves as the worst performing member. Regardless of their rating, all performance observations for member 1 were deleted when testing Hypothesis Two. Deleting these observations reduced the sample size from 2559 observations to 1901, or 74.29%.

Follow-up analyses to the test of null hypothesis two explored two conjectures. The first was how those respondents that rated themselves as the best performing member of the group rated other members, and what role diversity played in their

perceptions. This population totaled 181 observations. The second examined how members that were perceived as best overall were rated in task capabilities, and conversely, how those students that were perceived as worst overall were rated on task capabilities. This conjecture used the second data set of 1901 observations.

Summary

Data were collected from 822 student subjects in the beginning two weeks of their final semester. A survey was used early in the semester to reduce instructor bias and prevent students from reporting on current groups. Two types of surveys based on the overall group experience (least or most positive) were used to gather data on personal traits, tasks assigned, group control variables, group members' personal traits and task competency, perceived group learning effectiveness and other group members' performance. There were 617 complete surveys of group experiences, which were used to assess relationships concerning group learning effectiveness. Making each group member from the original survey into a single observation created a second data set. The observer was deleted from this second set, resulting in a set with 1901 observations, which was used to test relationship concerning perceptions of other members' performance. A third dataset that included only those members that perceived themselves as the best performing member resulted in a set of 181 observations, which was used to test perceptions of the worst performing member in a group. Missing data from the surveys did not differ with respect to gender, age, or race.

Although the Institution subsets were heteroskedastic on race and ethnicity variables, an argument for only transforming the model when using institutions in the linear regression was made. The level of analysis is individual-within-group, so

transformation will not be necessary as long as a group composition measure (dispersion index) is used for race or ethnicity.

The measure used to construct "group learning effectiveness" was found to be reliable. The three items within the measure had adequate inter-item correlations and a high standardized alpha coefficient ($\alpha = .87$). The measure used to construct "task interactivity" was also found to be reliable, with a high standardized alpha coefficient ($\alpha = .81$). To measure the difference of an individual's personal traits from their group member's traits, a dispersion index called a d_score was used. Correlations and canonical correlation analysis between personal d_scores and task scores did not find dangerous multicollinearity. Based on the results of these analyses the group learning effectiveness measure, task interactivity measure, and independent variables as measured by d_scores were used to investigate the two major research questions.

Statistical Models for testing hypotheses

After grouping each response into task categories of 'interdependent' or 'independent' we can test the assumption of null hypothesis one, which states "There is no difference between interdependent tasks and independent tasks in a group member's resultant perceptions of *learning effectiveness* in groups". Using responses from the interdependent task category, a test that there is no personal trait discrimination can be made by running regression in the usual manner and finding out whether on the basis of the t test if the estimated β (Beta) is statistically significant. If β (Beta) is statistically significant, the results indicate that the mean perceptions of categories are different. In addition, by holding all other variables constant, we may see for each unit change in our independent variables what the probability is for a change in perception of learning

effectiveness or perceptions of a member's performance. For example, for each unit change in d_race (d_score measuring an individual's racial diversity when compared to their group), what is the change in the rating of learning effectiveness? The same type of regression, run for those responses from the "independent task" category, can be compared in a similar way. In this way, the impact of each personal trait or task competence measure can be compared against means of perceptions of learning effectiveness when using interdependent tasks vs. independent tasks. A final model compares task categories (interdependent to independent) using both personal trait and task competence variables.

The Development of Perceptions of Learning Effectiveness

The first research question was "Does the type of task have an impact on perceived learning effectiveness?" To answer this question for the students in this sample, t-tests and regressions were used in an exploratory fashion to look for empirical relationships between the type of task, student's attributes, and perceptions of learning effectiveness. T-test are used to test for a significant difference between the mean learning effectiveness score when using an interdependent task and the mean learning effectiveness score when using an independent task. A linear model tests for relationships of personal traits using non-interdependent tasks and is compared to a linear model that tests for relationships of personal traits using interdependent tasks. The relationships between task type and task competency are measured the same way. A full linear model tests the importance of all variables against the type of task. The linear model is given as $Y = X\beta + \epsilon$ where ϵ is normally distributed. The specific linear model for this study is:

$LEib = \alpha_1 + \alpha_2sex + \alpha_3Age + \alpha_4Race + \alpha_5Ethnic + \alpha_6English + \alpha_8Class$ to test personal traits

$LEib = \beta X_1 + \beta X_2 + \beta X_3 + \beta X_4 + \beta X_5 + \beta X_6$ to test task competency

$LEib = \alpha_1 + \alpha_2sex + \alpha_3Age + \alpha_4Race + \alpha_5Ethnic + \alpha_6English + \alpha_8Class + \beta X_1 + \beta X_2 + \beta X_3 + \beta X_4 + \beta X_5 + \beta X_6$ to test all variables simultaneously

Where $LEib$ = respondent's perception of group learning effectiveness when using an interdependent task (repeated with $Leia$ = learning effectiveness using independent task).

X_1 = rating of task skill for communication

X_2 = rating of task knowledge through content or experience

X_3 = rating of task ability for creativity

X_4 = rating of task technical skills

X_5 = rating of task skill for interpersonal ability

X_6 = rating of task competence for dependability or attendance

Sex = d_score of student's gender

Age = d_score of student's age

Race = d_score of student's race

Ethnic = d_score of student's Ethnicity

English = d_score of student's Fluency

Class = d_score of student's Class standing

The full model has 6 polychotomous ordinal variables and 6 quantitative explanatory variables.

Use of Control Variables

This study examined the amount of variance accounted for by control variables and the mediating variable. Included in the model is the mediating variable of task type and control variables of report type (report on your Most (or Least) positive group experience), group consistency (whether student was in more than one group in the class), group tenure, group formation, and group size. These variables, as indicated by the adjusted R squared, accounted for 36.13% of the total variance in the model. (see

Table 4.13). The F statistic for the overall model is significant ($p = <0.0001$), indicating that the model explains a significant portion of the variation in the data. Only the parameter estimates of those variables whose alpha level is $P \Rightarrow 0.15$ are included in the Anova summary.

Table 4.13

Null Hypothesis 1: Regression of task and controls on learning effectiveness *

Maximum Regression Analysis of Variance						
Source	DF	Sum of Squares	Mean Square	F value	Prob>F	
Model	6	275.08	45.85	58.79	<0.0001	
Error	607	473.36	0.78			
C Total	613	748.44				
	Root MSE	0.88	R-square	0.37		
	Dep Mean	3.04	Adj R-sq	0.36		
	C.V.	29.10				
Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T	Standardized Estimate
INTERCEP	1	2.82	0.22	12.78	<0.0001	B= 0.00
REP_TYPE	1	1.18	0.07	16.20	<0.0001	B= 0.54
TTL_HRS	1	0.00	0.00	4.47	<0.0001	B= 0.16
Consistency	1	-0.33	0.10	-3.49	0.0005	B= -0.12

* In order of significance

Using stepwise regression, the results (See Table 4.14) show that report type accounted for over 31% of the variation in the model ($R\text{-Square} = 0.32$), or about 97% of the total variance accounted for by $R\text{-squared}$ (0.36). The large impact of report type overwhelms the effect size of other variables in the model. For example, while type of task (ttl_hrs) is in the expected direction (+) and shows high significance (0.0001) its

partial R-squared is small (0.03). The only other control variable of significance is group consistency, or whether a student was in more than one group for the class. The parameter estimates show an effect size of -0.33, and the direction (-) indicates that those members that are in more than one group have lower perceptions of learning effectiveness.

Table 4.14

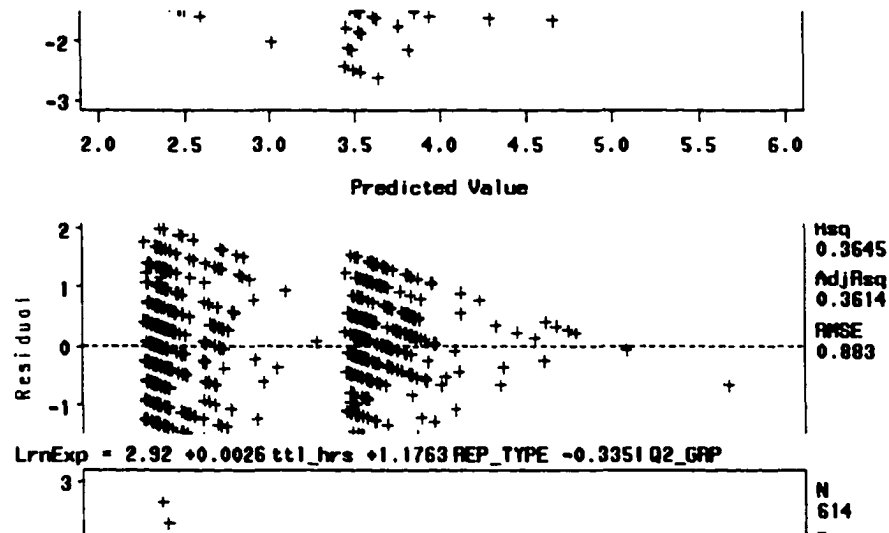
Summary of Stepwise Selection: Regression of Task and Controls on Learning Effectiveness

Variable	Partial R-Squared	Model R-Squared	F Value	Pr > F
Rep_type	0.32	0.32	285.17	<.0001
Ttl_hrs	0.03	0.35	31.11	<.0001
CONSISTENCY	0.01	0.36	13.06	0.0003

A graphical representation of the impact of Report Type can be seen in figure 4.2 below, as well as the standardized regression equation for the total population when only variables with significant effects ($\alpha = 0.05$) are included.

Figure 4.2

Test of task and controls on Learning Effectiveness: Maximum regression with standardized parameter estimates



The cluster to the left of the chart shows observations from reports of group experiences that were least positive, while the clusters to the right are observations from the group experiences that were most positive. The reports on most positive group experiences have an obviously higher perceived learning effectiveness score. To make sure that this higher score is statistically significant, a t-test was used to measure the difference in mean learning effectiveness between the two types of report (see Table 4.15 below). The significance of difference is high ($p < 0.0001$).

Table 4.15

T-Test Analysis: Report Type and Learning Effectiveness

Task Type	N	Mean	Prob > T
Least Positive Report	320	2.3278	$p < 0.0001$
Most Positive Report	311	3.5686	

It is not too surprising that report type explains such large variance in the fit of the model to the sample population. The sample population was randomly surveyed two ways; one reported on their “most positive” learning experience, the other reported on their “least positive” learning experience. It follows that those reporting on a positive learning experience are more likely to believe the learning effectiveness of groups to be high, and conversely, those that reported on their least positive experience are likely to believe group learning effectiveness to be low. In fact, this even split of the sample population actually creates two different sub-populations.

For these reasons, each statistical model was tested separately using samples determined by type of report. In addition to splitting tests of null hypothesis one into two sub-populations, all models using regression included the control variable ‘group consistency’, or whether a member was part of more than one group. Each test of a hypothesis is followed by an estimated equation of regression. The corresponding confidence intervals are found in Appendix H.

Task Effects on Perceptions of Learning Effectiveness

T-test analysis was conducted to assess the accuracy of null hypothesis one: “There is no difference between interdependent tasks and independent tasks in a group

member's resultant perceptions of learning effectiveness in groups." First, the total sample was tested, then split into sub-samples according to report type for further analysis.

From 631 valid observations, 443 respondents reported on groups using generally independent tasks, while 188 observations involved generally interdependent tasks. There was a high level of significance that the means of the learning effectiveness score for independent tasks ($\mu=2.7639$) was not equal to those of interdependent tasks ($\mu=3.3005$) with a significance level of $p < 0.0001$. The mean learning effectiveness score of interdependent tasks is 19.4% higher than that of independent tasks. These findings indicate that null hypothesis one is not supported, and that there *is* a difference between the type of task and a group member's perceptions of learning effectiveness (See Table 4.16). Respondents perceived experiences using group assignments that foster in-class and face-to-face instruction as 19.4% more effective than those group experiences that used independent tasks.

Table 4.16

T-Test Analysis: Differences in Learning Effectiveness compared by Task Type

Task Type	N	Mean	Prob > T
Independent	443	2.76	
Interdependent	188	3.30	$p < 0.0001$

The sample was then split by those students reporting on their most positive group experience vs. those reporting on their least positive group experience. Those

that were reporting on a more positive experience tended to have a higher proportion of interdependent tasks than those reporting on least positive experiences. In addition, both the significance of the results and the average score of learning effectiveness were lower for the least positive experience (see Table 4.17).

Table 4.17

T-Test Analysis: Difference in Learning Effectiveness -Task Type by Report Type

Population	Task Type	N	Mean	Prob > T
Least	Independent	249	2.37	$p>0.0300$
Positive	Interdependent	71	2.65	
Most	Independent	194	3.49	$p>0.0000$
Positive	Interdependent	117	3.96	

Again, null hypothesis one is not supported for either subpopulation. When controlling for type of report, the type of task makes a significant impact on perceptions of learning effectiveness. This impact is more pronounced for the students reporting on their most positive experience than for students reporting on least positive experiences. For least positive experiences, the mean learning effectiveness score of interdependent tasks is 11.8% higher than that of independent tasks. Likewise, for most positive experiences, the mean learning effectiveness score of interdependent tasks is 13.5% higher than that of independent tasks. When comparing the two subpopulations, learning effectiveness scores for those members using interdependent tasks and reporting on a positive group experience were almost 67% higher than those using interdependent tasks and reporting on a less positive group experience. This can be

expected, since high perceptions of group learning effectiveness should lead to an overall positive perception of the group experience.

Relationship between Personal Differences and Perceptions of Learning Effectiveness when Task is Interdependent

The first alternative hypothesis (Alternative Hypothesis 1a) is “Interdependent tasks will reduce the impact of a member's personal diversity in that member's perceptions of learning effectiveness”. In other words, face-to-face tasks should reduce negative judgments based on a member's apparent difference from the respondent. A linear regression was conducted to assess the extent to which a student's personal trait diversity may have influenced their perceptions of learning effectiveness in a group when the group task was generally interdependent. The regression was tested separately for the samples of “Most Positive” reports and “Least Positive” reports at a significance level of $\alpha = 0.15$.

It was expected that no personal trait would impact perceptions of learning effectiveness when interdependent tasks were used. Interdependent tasks from least positive experiences showed student diversity based on ethnicity, class standing, race and age to have significant impact on perceptions of group learning effectiveness. For “Most Positive” reports, only a member's diversity based on English fluency impacted perceptions of learning effectiveness. A summary of the stepwise procedure and analysis of variance is given in Table 4.18 and Table 4.19.

Table 4.18

Relationship between Member's Personal Differences and Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Stepwise Selection

Population	Trait Variable	Partial R-Square	Model R-Square	F	Prob > F
Least	Consistency	0.06	0.06	4.29	0.04
Positive	D_class	0.05	0.11	3.80	0.05
	D_ethnic	0.06	0.17	4.45	0.05
	D_race	0.03	0.20	2.55	0.10
	D_age	0.03	0.23	2.50	0.12
Most	Consistency	0.03	0.03	3.66	0.06
Positive	D_fluent	0.02	0.05	2.30	0.13

The model explained much more of the variance for least positive group experiences (23.05%) than for most positive group experiences (5.26%). In the least positive sample, ethnicity alone explained more of the variance, and had more impact on perceptions of group learning effectiveness (5.69%), than the entire model for group experiences rated most positive (5.26%).

Table 4.19

Relationship between Member's Personal Differences and Perceptions of LearningEffectiveness when using Interdependent Tasks: Summary of Analysis of Variance *

Population	Trait Variable	Parameter Estimate	Standard Error	T Value	Pr > t	Standardized Estimate
Least	Intercept	3.73	0.52	7.20	<.0001	0.00
Positive	Consistency	-0.59	0.27	-2.19	0.0325	-0.24
	D_class	-0.63	0.23	-2.77	0.0074	-0.32
	D_ethnic	1.12	0.45	2.51	0.0148	0.36
	D_race	-0.79	0.44	-1.80	0.076	-0.26
	D_age	0.32	0.20	1.58	0.1192	0.19
Most	Intercept	4.61	0.36	12.89	<.0001	0.00
Positive	Consistency	-0.31	0.20	-1.57	0.12	-0.15
	D_fluent	-0.24	0.16	-1.52	0.1324	-0.15

* In order of significance (after control variable for group consistency).

The estimated regression equations for the two subpopulations were constructed from the parameter estimates. For least positive group experiences, Learning Effectiveness $b_{i(\text{least})} = 3.73 - 0.59 \text{ Consistency}_i - 0.63 \text{ D_class}_i + 1.12 \text{ D_ethnic}_i - 0.79 \text{ D_race}_i + 0.32 \text{ D_age}_i + E_i$. For the most positive group experiences, Learning Effectiveness $b_{i(\text{most})} = 4.61 - 0.31 \text{ Consistency}_i - 0.24 \text{ D_fluent}_i + E_i$. Confidence intervals of 95% for each significant variable (using a two-tailed test) are given in Appendix H.

As can be seen from the regression equations, several personal traits impact the perception of group learning effectiveness when using interdependent tasks in a less

positive group experience. As a group member's ethnic or age diversity (within the group) increases, they view group learning effectiveness more positively. When a group member is different racially or has a different class standing from the group, group learning effectiveness is evaluated lower.

When group members use interdependent tasks in a positive situation, only English fluency is an important factor in perceptions of learning effectiveness, accounting for about 4% of the model's variance. English fluency was measured as 1=high and 5=low, so a member with a high diversity score is most likely not fluent. The direction of impact implies that a member that is not fluent (more diverse in English skills from the group) will rate learning effectiveness lower when required to interact. As the member's English skills come into line with the group, the rating of group learning effectiveness increases. Alternative Hypothesis 1.a, which was "Interdependent tasks will reduce the impact of a member's personal diversity in that member's perceptions of learning effectiveness", had mixed support.

Relationship between Member's Task Competencies and Perceptions of Learning Effectiveness when Task is Interdependent

The second alternative hypothesis was "Interdependent tasks will increase the impact of a member's task-related traits in that group member's perceptions of learning effectiveness". In other words, a member's task behaviors, abilities, and skills will have more importance when the task is interactive, and measures by a higher learning effectiveness score. Alternative hypothesis 1b was also tested using linear regression on two samples split by report type and included group consistency as a control. It was expected that several task competencies would have a positive impact on a student's

perception of learning effectiveness, but this was only true for the trait of dependability when reporting on least positive group experiences. A summary of the stepwise regression is in Table 4.20 below.

Table 4.20

Relationship of Member's Task competency and Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Stepwise Procedure

Population	Trait Variable	Partial R-Squared	Model R-Squared	F	Prob > F
Least Positive	Consistency	0.06	0.06	4.29	0.04
	Dependability	0.03	0.09	2.16	0.15
Most Positive	Consistency	0.03	0.03	3.66	0.06

Dependability probably did not explain much of the model's variance ($F=0.15$). in addition, the effect size of dependability was small (partial $R^2 = 0.03$). The group members that rated themselves as less dependable than the rest of the group tended to view learning effectiveness in groups more highly than those that felt they were dependable. The model for least positive group experiences only explained about 9% of the total variance. The reports on most positive group experiences had no significant effects other than the control for group consistency, and only explained about 3% of model variance. The estimated regression equations were constructed from the ANOVA's parameter estimates, summarized in Table 4.21 below.

Table 4.21

Relationship between a Member's Task differences and Perceptions of Learning**Effectiveness when using Interdependent Tasks: Summary of Analysis of Variance**

Population	Trait Variable	Parameter Estimate	Standard Error	T Value	Pr > t	Standardized Estimate
Least	Intercept	4.09	0.59	6.99	<.0001	0
Positive	Consistency	-0.60	0.29	-2.08	0.0415	-0.24
	Dependable	-0.60	0.40	-1.47	0.1467	-0.17
Most	Intercept	4.63	0.36	12.88	<.0001	0
Positive	Consistency	-0.38	0.20	-1.91	0.0584	-0.18

The estimated regression equations for the two subpopulations were constructed from the parameter estimates. For least positive group experiences, Learning Effectiveness $b_{i(\text{least})} = 4.09 - 0.60 \text{ Consistency}_i - 0.60 \text{ Dependable}_i + E_i$. For the most positive group experiences, Learning Effectiveness $b_{i(\text{most})} = 4.63 - 0.38 \text{ Consistency}_i + E_i$. Confidence intervals of 95% for all variables (using a two-tailed test) are given in Appendix H.

Relationship between Member's Demographic Diversity and Perceptions of Learning Effectiveness when Task is Independent

It is expected that independent tasks will reduce the face-to-face interaction of the group, so if a member is different from the group on demographic traits, these traits will be noticed more and will bias that member's perception of the learning effectiveness of groups. The third alternative hypothesis is "Independent tasks will increase the impact of a member's personal diversity in that member's *perceptions of*

learning effectiveness”, and is tested like the other alternatives using linear regression with two samples formed by report type. When using independent tasks it was expected that several personal diversity scores would have a negative impact on a student’s perception of learning effectiveness, but only least positive group situations showed impact from personal diversity. A summary of the stepwise regression is in Table 4.22 below.

Table 4.22

Relationship between Member’s Personal Differences on Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Stepwise Procedure

Population	Trait Variable	Partial R-Square	Model R-Square	F	Prob > F
Least	Consistency	0.01	0.01	3.26	0.0721
Positive	D_race	0.01	0.02	2.92	0.0887
	D_gender	0.01	0.03	2.22	0.1373
Most	Consistency	0.04	0.04	8.00	0.0052
Positive					

Although the size of the effect was very small (3% total when controlled by group consistency), those students whose race or gender were more diverse than their group perceived group learning effectiveness as higher when they were not required to interact. The estimated regression equations were constructed from Analysis of Variance, summarized in table 4.23 below.

Table 4.23

Relationship between Member's Personal Differences on Perceptions of LearningEffectiveness when using Independent Tasks: Summary of Analysis of Variance.

Population	Trait Variable	Parameter Estimate	Standard Error	T Value	Pr > t	Standardized Estimate
Least	Intercept	2.97	0.30	9.79	<.0001	0
Positive	Consistency	-0.30	0.15	-2.00	0.0470	-0.13
	D_gender	-0.29	0.20	-1.49	0.1373	-0.07
	D_race	0.37	0.18	2.01	0.0451	0.13
Most	Intercept	4.32	0.29	14.74	<.0001	0
Positive	Consistency	-0.45	0.16	-2.83	0.0052	-0.20

The estimated regression equation for the impact of a member's task contributions on the two subpopulations was constructed from the parameter estimates. For least positive group experiences, Learning Effectiveness_{ai (least)} = 2.9744 - 0.3063 Consistency_i - 0.2944 D_gender_i + 0.3696 D_race_i + E_i. For the most positive group experiences, Learning Effectiveness_{ai (most)} = 4.3178 - 0.2928 Consistency_i + E_i.

Relationship between a Member's Task contributions and Perceptions of Learning Effectiveness when Task is Independent

The fourth alternative hypothesis is "Independent tasks will decrease the impact of a member's task-related contributions in that member's perceptions of learning effectiveness". When groups have less face-to-face time, members will not have the chance to share their task behaviors, skills and abilities and therefore will perceive the learning effectiveness of groups to be low. This hypothesis is also tested using linear

regression with samples formed according to report type. For the sample reporting on least positive experiences, the hypothesis was supported, and task competency showed no impact on a student's perception of learning effectiveness. For group experiences that were most positive, interpersonal skills were found to impact learning effectiveness scores at the $\alpha=.15$ level of significance, but only explained about 1.76% of variance in the model. A summary of the stepwise regression is given in Table 4.24.

Table 4.24

Relationship between a Member's Task Contributions and Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Stepwise Procedure

Population	Trait Variable	Partial R-Squared	Model R-Squared	F	Prob > F
Least Positive	Consistency	0.01	0.01	3.26	0.0721
Most Positive	Consistency	0.04	0.04	8.00	0.0052
	Interpersonal	0.02	0.06	3.5	0.0628

The higher a member's interpersonal skills, the more positively they perceived group learning effectiveness. This was only true for members reporting on their most positive group experience. Evidently, interpersonal skills are not enough to overcome other problems that are involved in a member's least positive group experience. The analysis of variance is summarized in Table 4.25.

Table 4.25

Relationship between a Member's Task Contributions and Perceptions of LearningEffectiveness when using Independent Tasks: Summary of Analysis of Variance

Population	Trait Variable	Parameter Estimate	Standard Error	T Value	Pr > t	Standardized Estimate
Least	Intercept	2.88	0.29	10.00	<.0001	0
Positive	Consistency	-0.28	0.15	-1.81	0.0721	-0.11
Most	Intercept	4.09	0.31	13.02	<.0001	0
Positive	Consistency	-0.46	0.16	-2.94	0.0037	-0.21
	Interpersonal	0.40	0.21	1.87	0.0628	0.13

The estimated regression equations for the impact of task contributions on the two subpopulations were constructed from the parameter estimates. For least positive group experiences, Learning Effectiveness $_{ia (least)} = 2.88 - 0.28 \text{ Consistency}_i + E_i$. For the most positive group experiences, Learning Effectiveness $_{ia (most)} = 4.09 - 0.46 \text{ Consistency}_i + 0.40 \text{ Interpersonal}_i + E_i$.

Relationship between All Variables on Perceptions of Learning**Effectiveness when Task is Independent**

This study ran a full model regression as another way of examining the conjectures proposed. The full model combines the first conjecture; "interdependent tasks will decrease the impact of a member's personal diversity traits in that group member's perceptions of learning effectiveness" and the second conjecture; "Interdependent tasks will increase the impact of a member's task diversity in that member's perceptions of learning effectiveness". A full model is used to examine the

impact of the two types of traits – both personal and task. An underlying concept is that with interdependent tasks a member's task-related traits have more impact than a member's personal traits when they evaluate group learning effectiveness. To examine this concept, a regression model that includes all personal traits and all task competencies is sorted according to the effect size of each variable on learning effectiveness.

The study used stepwise regression split into two subpopulations according to report type. Only those variables that met the $\alpha = 0.15$ significance level were included. A summary of the regression is given in table 4.26 below.

Table 4.26

Relationship between All Variables on Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Stepwise Procedure*

Population	Trait Variable	Partial R-Squared	Model R-Squared	F	Prob > F
Least Positive	Consistency	0.06	0.06	4.29	0.0423
	D_Ethnic	0.06	0.17	4.45	0.0388
	D_Class	0.05	0.11	3.850	0.0556
	Technical	0.05	0.28	3.91	0.0524
	D_race	0.03	0.20	2.55	0.1150
	D_age	0.03	0.23	2.50	0.1192
Most Positive	Consistency	0.03	0.03	3.66	0.0584
	D_Fluent	0.02	0.05	2.30	0.1324

*In order of effect size

The type and direction of the variables were not as expected or hypothesized. Rather than task contributions showing more impact on perceptions of group learning effectiveness, personal traits had more impact, especially for reports on less positive group experiences. For members reporting on their least positive group experience the model explained 23% of the variance. For those members reporting on their most positive group experience only 5% of the variance was explained. The only skill of significance is technical ability – and then only in the subpopulation for least positive group experiences. The analysis of variance for the two subpopulations is given in table 4.27 below.

Table 4.27

Relationship between All variables and Perceptions of Learning Effectiveness when using Interdependent Tasks: Summary of Analysis of Variance*

Population	Trait Variable	Parameter Estimate	Standard Error	T Value	Pr > t	Standardized Estimate
Least	Intercept	3.15	0.59	5.37	<.0001	0
Positive	Consistency	-0.57	0.27	-2.15	0.0359	-0.23
	D_class	-0.69	0.22	-3.09	0.0030	-0.36
	D_ethnic	1.21	0.44	2.77	0.0074	0.39
	D-race	-0.95	0.44	-2.17	0.0335	-0.31
	D_age	0.41	0.20	2.01	0.0491	0.24
	Technical	0.86	0.43	1.98	0.0524	0.22
Most	Intercept	4.61	0.36	12.89	<.0001	0
Positive	Consistency	-0.31	0.20	-1.57	0.1200	-0.15
	D-Fluent	-0.24	0.16	-1.52	0.1324	-0.15

***In order of significance, after control 'consistency'**

The estimated regression equations for the impact of task competency on the two subpopulations were constructed from the parameter estimates. For least positive group experiences, Learning Effectiveness $_{bi (least)} = 3.15 - 0.57 \text{ Consistency}_i - 0.69 \text{ D_Class}_i + 1.21 \text{ D_Ethnic}_i - 0.95 \text{ D_Race}_i + 0.41 \text{ D_Age}_i + 0.86 \text{ Technical}_i + E_i$. For the most positive group experiences, Learning Effectiveness $_{bi (most)} = 4.61 - 0.31 \text{ Consistency}_i - 0.24 \text{ D_fluent} + E_i$.

Relationship between All Variables and Perceptions of Learning Effectiveness when Task is Independent

The third conjecture was "Independent tasks will increase the impact of a member's personal-related traits in that group member's perceptions of learning effectiveness", while the fourth conjecture was "Independent tasks will decrease the impact of a member's task-related traits in that group member's perceptions of learning effectiveness". The relationship of both conjectures can be studied by running a full model regression on all observations using an independent task.

Again, a regression model that includes all personal traits and all task competencies is sorted according to the significance of impact on group learning effectiveness. The study used stepwise regression split into two subpopulations according to report type. Only those variables that met the $\alpha = 0.15$ significance level were included. A summary of the regression is given in table 4.28 below.

Table 4.28

Relationship between All Variables and Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Stepwise Procedure*

Population	Trait Variable	Partial R-Squared	Model R-Squared	F	Prob > F
Least Positive	Consistency	0.01	0.01	3.26	0.0721
	D-Race	0.01	0.02	2.92	0.0887
	D-gender	0.01	0.03	2.22	0.1373
Most Positive	Consistency	0.04	0.04	8.00	0.0052
	Interpersonal	0.02	0.06	3.5	0.0628

* in order of probability

The hypothesis predicted an impact of personal traits such as race and gender, but the impact of interpersonal task skills while using an independent task was not expected. The analysis of variance for the two subpopulations is given in table 4.29 below.

Table 4.29

Relationship between All Variables and Perceptions of Learning Effectiveness when using Independent Tasks: Summary of Analysis of Variance

Population	Trait Variable	Parameter Estimate	Standard Error	T Value	Pr > t	Standard-ized Est.
Least Positive	Intercept	2.97	0.30	9.79	<.0001	0
	Consistency	-0.31	0.15	-2.00	0.0470	-0.13
	D_gender	-0.29	0.20	-1.49	0.1373	-0.10
	D_race	0.37	0.18	2.01	0.0451	0.13
Most Positive	Intercept	4.09	0.3144	13.02	<.0001	0
	Consistency	-0.46	0.16	-2.94	0.0037	-0.2089
	Intrpersnl	0.40	0.21	1.87	0.0628	0.1330

The estimated regression equations for the impact of task contributions on the two subpopulations were constructed from the parameter estimates. For least positive group experiences, Learning Effectiveness_{ai} = 2.97 - 0.30 Consistency_i - 0.29 D_gender_i + 0.37 D_race_i + E_i. For the most positive group experiences, Learning Effectiveness_i = 4.09 - 0.46 Consistency_i + 0.40 Interpersonal + E_i.

Summary of Development of Perceptions of Learning Effectiveness

Social categorization and self-categorization theory suggests that individuals will have more positive attitudes towards the group and the group experience when they are similar to the group. Conversely, an individual with high diversity compared to their group should have a lower perception of the group and the group experience. In

this case, the construct of the group experience being measured was 'learning effectiveness of groups'. T-tests indicate that students engaged in interdependent group tasks perceive the effectiveness of learning in a group more positively than students engaged in independent group tasks.

Linear regression reveals certain traits that significantly impact a student's perception of learning effectiveness when the group task is interdependent. When the situation is less positive, greater member diversity based on ethnicity and age have a positive impact on learning effectiveness, while diversity based on race or class standing has a negative impact on learning effectiveness.

This study had two sub-samples, based on either a student's most positive group experience or their least positive group experience. When the student's group is categorized as their least positive experience, racial diversity has an impact on perceived learning effectiveness no matter what type of task is used. An interesting finding in this sub-sample is that the direction of the effect of racial diversity is different according to the task used. For interdependent tasks, members rated learning effectiveness higher as their racial diversity decreased. When the task is independent, racially diverse members perceive groups as more effective. In other words, racially diverse members would rather work alone.

In the sub-sample of least positive group experiences, the effects of a member's task abilities varied according to the task used. The task competency measure of dependability is significant when a group uses interdependent tasks, while interpersonal skills have significant impact on perceived learning effectiveness when independent tasks are used. Less dependable members perceived group learning effectiveness as

higher when tasks are interdependent, while more personally skilled members rated learning effectiveness high when tasks are independent.

For the full model, personal diversity, or a member's demographic difference from the group, has strong impact when the student is in the sample for least positive group experiences regardless of task type. A member's personal difference from their group mattered when the group experience was poor (least positive report) but not when the experience was good (most positive report).

In particular, when testing the sample of least positive group experiences, an increase in a member's ethnic difference resulted in an increase of perceived learning effectiveness if interdependent tasks were used. In other words, ethnically diverse students preferred the opportunity to work interactively with other members. Another positive effect of an interactive task is that age diversity is positively correlated with higher perceptions of group learning effectiveness. On the other hand, racial and class diversity led to lower perceptions of group learning effectiveness. With interactive tasks, most of the diversity that was significant in the "least positive" sub-sample tended to be personal demographic factors. There is factor of task ability — 'technical skills' — that is positively correlated with learning effectiveness.

When the task is independent the direction of race is reversed within the sub-sample of least positive group experiences. In other words, students who are racially different from the rest of the group rate group learning effectiveness higher when their interaction with the group is decreased.

The impact of almost all personal traits or task competencies dissolved when testing the sub-sample of most positive group experiences. A member's diversity in

English fluency leads to low group effectiveness scores when using interdependent tasks. When the group experience is most positive, interpersonal skills have a positive impact on perceptions of learning effectiveness when using independent tasks.

While type of task does lessen the impact of personal stereotypes, there seems to be other environmental factors in less positive group situations that have more impact than type of task.

The Development of Perceptions of Member Performance

The second research question asks “Does the type of task have an impact on perceptions of another member?” In other words, does the task affect how a group member’s performance is perceived? To measure the perception of member competency, the respondent had to make a choice. This resulted in one 'best' member (obs. = 1) and one 'worst' member (obs. = 0). In this study, even those members not chosen were given a neutral value (obs. = 0.5) to complete a full matrix. This sample was an expanded version of the original survey sample. Each member of the group that was described and evaluated on the original survey became a single observation.

Since there are only three possible outcomes, the assumption that the dependent variable is continuous and normally distributed is not appropriate. Therefore, the commonly used linear probability model was not used as this hypothesis’ probability model because it can lead to predicted probabilities outside the interval [0,1]. Choice situations require probit or logit regressions because they remain inside the interval [0,1] (Griffiths, et. al., 1993 page 751). Fomby, et. al. point out that two choices of the nonlinear function $P_i = g(x_i)$ are the cumulative density functions of normal and logistic random variables. The former gives rise to the probit model (based on probabilistic

cumulative distribution function) and the latter to the logit model (based on logistic cumulative distribution function) (Fomby, Hill, Carter, & Johnson, 1984; page 340). This study uses an extension of the logit model that allows a choice between more than two alternatives. Not only does the logit model extend to polychotomous choice situations, but unlike multinomial choice models, it deals with ordered alternatives. In a multinomial regression there is no natural ranking of the alternatives, while clearly the dependent variable "member competency" is a ranking between three alternatives; 'best', 'neutral' and 'worst'. In particular, the SAS logistic procedure fits a parallel lines regression model that is based on the cumulative distribution probabilities of the response categories, rather than on their individual probabilities (SAS Institute, 1994). Because SAS uses response level ordering, with the lowest value given the value '1' and representing the event to be modeled, this study used a descending order option. Otherwise, SAS would reverse the signs of the parameter estimates— changing 'worst overall performance' which is coded '0' to '1'. This model tested for relationships of personal traits using non-interdependent tasks and compared that model to a model that tested for relationships of personal traits using interdependent tasks. The relationships between task type and task contributions were measured the same way. A full model tested the importance of all variables against the type of task. For the logit model the choice probabilities are given by: $P_i = F(\mathbf{x}'_i\beta) = F(I_i)$ where F is the cumulative distribution of a logistic random variable. The model has the form $g(\Pr(Y \leq i|\mathbf{x})) = \alpha_i + \beta'\mathbf{x}$, $1 \leq i \leq k$. The specific model for this study is:

$MPib = \alpha_1 + \alpha_2\text{sex} + \alpha_3\text{Age} + \alpha_4\text{Race} + \alpha_5\text{Ethnic} + \alpha_6\text{English} + \alpha_8\text{Class}$ to test personal traits

$MPib = \beta X1 + \beta X2 + \beta X3 + \beta X4 + \beta X5 + \beta X6$ to test task competency

$MPib = \alpha 1 + \alpha 2sex + \alpha 3Age + \alpha 4Race + \alpha 5Ethnic + \alpha 6English + \alpha 8Class + \beta X1 + \beta X2 + \beta X3 + \beta X4 + \beta X5 + \beta X6$ to test all traits simultaneously

Where MPib = perception of a group member when using an interdependent task (repeated with MPia = member performance using independent task).

X1 = rating of task skill for communication

X2 = rating of task knowledge through content or experience

X3 = rating of task ability for creativity

X4 = rating of task technical skills

X5 = rating of task skill for interpersonal ability

X6 = rating of task competence for dependability or attendance

Sex = d_score of student's gender

Age = d_score of student's age

Race = d_score of student's race

Ethnic = d_score of student's Ethnicity

English = d_score of student's Fluency

Class = d_score of student's Class standing

The full model has 6 polychotomous ordinal variables and 6 quantitative explanatory variables.

Task Effects on Perceptions of Another Member's Performance

Frequency counts and plots, Logistic regression, profiles of members through crosstabulation, and chi-square tests were conducted to assess the accuracy of null hypothesis two: "There is no difference between interdependent tasks and independent tasks in a group member's resultant perceptions of *another member's contribution to group performance*." The surveyed member was dropped as an observation from the dataset, since the question is focusing on how the surveyed member judged *other* members.

Report Type's impact on model

Before examining the findings of statistical tests, the amount of variance accounted for by control variables was determined using Logistic regression. Two control variables had a significant impact. Strong significance was found for the impact of report type ($p=0.01$), but moderate significance was found for the impact of the type of system used (quarterly vs. semester) ($p=0.10$). A summary of the impact of controls from Table 4.30 below shows that very little variance from the model is explained by controls. The chi-square statistic to test $\text{Beta} = 0$ is not significant, with a Likelihood Ratio score of $p > 0.17$. Only intercepts and those variables whose significance level is $P \leq 0.15$ are included in the Logistic Procedure summary.

Table 4.30

Logistic regression of task and controls on member performance

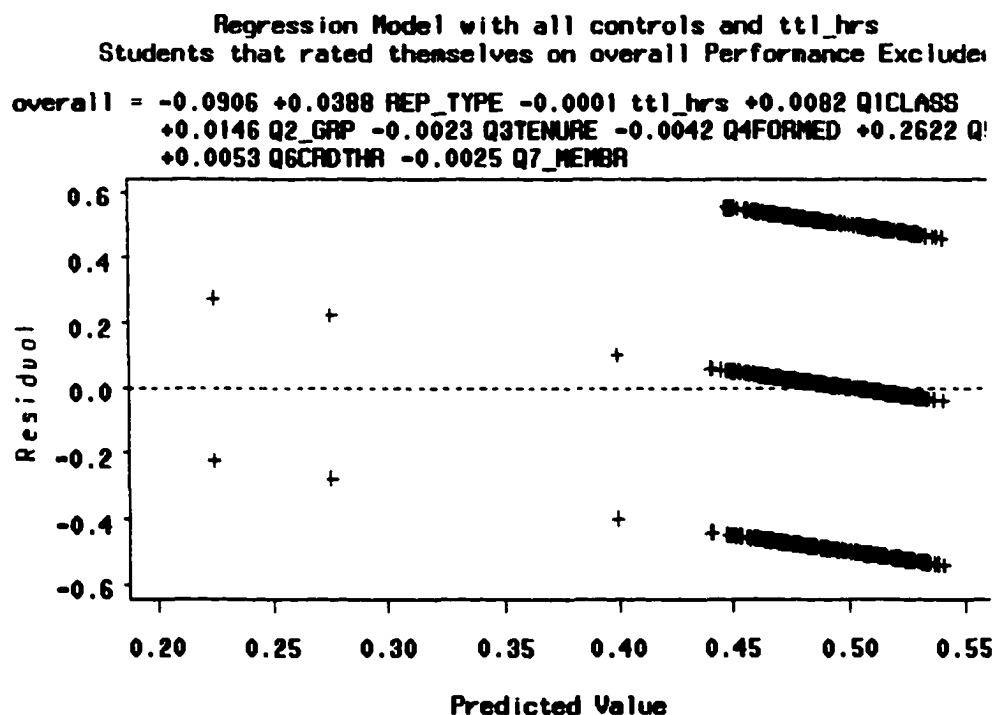
Beta = 0		DF	Prob> Chi-Square	'Overall' Value	N
Likelihood		8	0.17	1	317
Score		8	0.17	.5	1068
Wald		8	0.18	0	350
R-sq			.0066		
Adj R-sq			0.0078		
Variable	DF	Parameter Estimate	Standard Error	chi ²	Prob> chi ²
INTERCEPT	1	-5.06	2.06	6.03	0.014
INTERCEPT2	1	-2.17	2.06	1.11	0.292
REP_TYPE	1	0.24	0.10	5.95	0.015
Q5System	1	1.62	0.99	2.67	0.101

R-square is 0.0078, so less than 1% (0.8%) of this model is explained through the tested variables. What is indicated is a high significance of the variable for type of report ($p = 0.015$).

The residual vs. predicted observations of control variables and mediating variable `ttl_hrs` was plotted. The polychotomous nature of the dependent variable splits the model into three parallel downward sloping lines (see Figure 4.3). As expected, the logit model has fit 3 parallel lines (figure 4.3). This plot supports the assumption of a non-normal distribution.

Figure 4.3

Plot of Residuals of control variables and Task variable on overall Performance



A stepwise regression of control variables and `ttl_hrs` to member performance scores showed that the type of report (most vs. least positive experience) accounted for only 0.3% (partial R-squared = 0.003) of the variance explained by controls (model R-

squared = 0.005). The other significant control variable was Q5system, or whether classes ran on a semester or quarterly period. A summary of the Stepwise Regression is given in Table 4.31 below.

Table 4.31

Relationship of Controls on Perceptions of Member Performance: Summary of Stepwise Procedure

Trait Variable	Partial R-Squared	Model R-Squared	F	Prob > F
Rep_type	0.003	0.003	5.98	0.0146
Q5system	0.001	0.005	2.42	0.1198

The probability that Report type explains a significant amount of the regression is high ($F > 0.0146$) which may indicate that there should be two separate sub-populations. Before testing the impact of independent variables (personal traits and task contributions) this study tested 'report type' and the mediating variable 'ttl_hrs' using logistic regression (see Table 4.32) to determine the amount of variance in the model explained by the type of report and type of task.

Table 4.32

Logistic Regression of Task and Report Type on Member Performance *

Beta = 0	DF	Prob> Chi-Square	'Overall' Value	N	
Likelihood	2	0.03	1	329	
Score	2	0.03	.5	1113	
Wald	2	0.03	0	359	
	R-sq	.0046			
	Adj R-sq	0.0078			
Parameter Standard					
Variable	DF	Estimate	Error	chi ²	Prob> chi ²
INTERCEPT	1	-1.57	0.085	343	<0.001
INTERCEPT2	1	1.32	0.081	261	<0.001
REP_TYPE	1	0.24	0.09	6.5	0.01
Ttl_hrs	1	-0.00	0.00	1.6	0.21

* In order of significance

Type of task (ttl_hrs) is not in the expected direction (-) and its effect size is very small (-0.0006 before rounding). In addition, the amount of variance explained by this model is very low (Max-rescaled $R^2 = 0.0046$). Whether a student was reporting on their most or on their least positive type of group experience accounted for a more significant portion of the model than type of task, and for this reason the variable "report type" again indicates two different populations of equal size. Overall, this model seems to have weak explanatory power.

Comparing the means of face-to-face hours between the least positive and most positive samples shows a highly significant difference ($p > 0.0000$). Tasks in the least

positive group experiences averaged 47.44 hours face-to-face, while tasks in Most positive experiences averaged 78.90 hours face-to-face (see Table 4.33 below).

Table 4.33

T-test of Report Type and Hours Face-to-face

Report Type	N	Mean	Prob > T
Least Positive	882	47.44	$p= 0.0000$
Most Positive	919	78.90	

The large difference between the two populations in the type of task used further supported the need to test least and most positive report types separately. Once the sample population was split into subpopulations by “most” or “least” positive report, no control variable had any significant impact on the outcomes of perceptions of other member’s performance. Every statistical test for conjectures relating to null hypothesis 2 was repeated twice – once for the Most Positive population, then again for the Least Positive population.

Null Hypothesis 2 – Test of assumptions using T-tests

As summarized above, the sample was split into two populations comprised of Most Positive Group experiences and Least Positive Group experiences. A t-test was used to compare the distribution of performance scores between the two populations. From 1801 valid observations, 919 observations were from reports on Most Positive group experiences, and 882 observations were from reports on Least Positive group experiences, dividing the total sample into fairly even sized sub-populations of 51% to 49% respectively. Performance scores from the Least Positive group experience population were lower ($\mu=0.47$) than those from Most Positive experiences ($\mu=0.51$). Using a paired t-test, the probability that the two samples’ means are distinct is $p=0.02$.

This is further validation for splitting the overall sample into two populations (See Table 4.34).

Table 4.34

T-test of Report Type and Member Performance Scores

Report type	N	Mean	Prob > T
Least Positive	882	0.47	$p=0.0208$
Most Positive	919	0.51	

This study assumed that each respondent picked one “best” member and one “worst” member, regardless of report type. This assumption may be incorrect for the expanded matrix. It seems clear that observers involved in more positive group experiences chose a “Best Overall” member, or refrained from choosing a “Worst Overall” member more often than observers involved in less positive group experiences. A response profile shows that for the population reporting on less positive experiences, there were 154 ‘Best’ scores, 199 ‘Worst’ scores, and 529 neutral scores. For the population reporting on most positive experiences, there were 175 ‘Best’ scores, 160 ‘Worst’ scores, and 584 neutral scores (See Table 4.35). From frequency tables of attrition rates, it can be seen that respondents were less willing to identify or judge another member as the worst performer as compared to identifying the best performer (see Table D.9 at the end of Appendix D).

Table 4.35

Frequency of performance scores by report type

Report Type	Best	Worst	Neutral	Sample Total
Most Positive	175	160	584	919
Least Positive	154	199	529	882
Score Totals	329	359	1113	1801

Test of Assumption of equal means for overall performance:

Every respondent, whether reporting on groups that were generally independent or interdependent, had to choose only *one* “Best performing” (value = 1) and only *one* “Worst performing” (value = 0) member. Therefore, every observation, no matter what task type (or population type), should have the same mean of 0.5. A previous t-test implied that this assumption may not hold, so t-test of overall performance scores by task types is presented. From 1801 valid observations, 1181 respondents reported on groups using generally independent tasks, while 620 observations involved generally interdependent tasks. A T-test was used to measure the assumption that there was no difference in means between task type categories. There was a very low level of significance ($p=0.26$) that the means of the overall performance score for independent tasks ($\mu=0.496$) were not equal to those of interdependent tasks ($\mu=0.479$). For detailed summary, see Table D.3 at the end of Appendix D.

Small discrepancies in the mean performance score between task types may be due to the fact that group sizes vary, or because there is a different proportion of task types in the “most positive” population than “least positive” population. This possibility was examined through frequency counts and profile analysis.

In fact, there was some discrepancy found between tasks and population.

Although performance scores were forced so $\mu = 0.5$, interdependent tasks were used almost two times more in the sample of most positive group experiences (407 observations) compared to least positive group experiences (213 observations). The sample consisting of less positive group experiences rated other group members slightly lower than the sample of most positive group experiences. (see table 4.36). Independent tasks resulted in slightly higher perceptions of other group members than interdependent tasks.

Table 4.36

T-Test: Report Type and Task Type

Population	Task Type	N	Mean	Pr > t	F	Prob > F
Least	Independent	669	0.48	0.2550	1.07	0.5609
Positive	Interdependent	213	0.45			
Most	Independent	512	0.52	0.4009	1.20	0.0501
Positive	Interdependent	407	0.50			

Another source of discrepancy in the mean performance score between task types may be due to a non-linear distribution. Mantel Haenszel and Pearson chi-square statistics were used to test for a non-linear distribution. Results of the Mantel Haenszel and Pearson chi-square statistics were either mixed or not significant, which may be due to unequal cell sizes. Because the results are weak no assumption as to nonlinear distribution could be made. A summary of these tests is given in Appendix G.

Summary: Impact of Control Variables

The model was regressed using the continuous variable for task type, `ttl_hrs`, and all control variables. Control variables were found to have significant impact. Report type had a significant impact on overall performance. T-tests, F and chi-square

statistics support splitting the sample into two sub-populations based on reports of “least” vs. “most” positive group experiences. After this split none of the control variables exceeded the alpha level of significance of 0.15, and so controls were not included in statistical tests of null hypothesis two or its tests of conjectured explanations. A summary of the regression of controls is found in Appendix Table D.10.

Relationship of Task Contributions and Member Performance

The sample of most positive group experiences chose a “Best Overall” member, or refrained from choosing a “Worst Overall” member more often than observers involved in less positive group experiences. A response profile shows that for the population reporting on less positive experiences, there were 154 ‘Best’ scores, 199 ‘Worst’ scores, and 529 neutral scores, compared to 175 ‘Best’ scores, 160 ‘Worst’ scores, and 584 neutral scores for most positive group experiences.

A T-test indicated a difference in mean performance scores for group members between task type categories. Although the level of significance was low ($p=0.26$) the means of the overall performance score for independent tasks ($\mu=0.496$) were not equal to those of interdependent tasks ($\mu=0.479$). In summary, the sample consisting of less positive group experiences rated other group members slightly lower than the sample of most positive group experiences (see Table 4.36). Independent tasks resulted in slightly higher perceptions of other group members than interdependent tasks.

Relationship between Personal Differences and Perceptions of Another Member's Performance when Task is Interdependent

The fifth conjecture was “Interdependent tasks will reduce the impact of another member's personal diversity in perceptions of *another member's contribution to group performance*”. In other words, negative stereotypes due to demographics differences will be lessened or eliminated by an interdependent task. A logit regression was conducted to assess the extent to which a student's personal trait diversity may have influenced their perceptions of another member's performance when the group task was generally interdependent. The Logit regression was run on both populations (most and least positive experience). The unequal size of the different samples could cause overdispersion, which causes the standard error to be underestimated. To reduce the threat of over dispersion a Williams scale model was used for every Logistic regression that tested further conjectures. The score chi-square for testing the proportional odds assumption of the reports on least positive experiences is 5.23, which is nonsignificant with respect to a chi-squared distribution with 7 degrees of freedom ($p=0.63$). The most positive group experiences had a similarly nonsignificant chi-square (chi-square = 9.14, $p>0.24$). This indicates that a proportional odds model is appropriate for the data.

Using *d_scores* to measure personal trait diversity, no personal traits were found to have significant impact on performance scores at a significance level of $\alpha=.05$ for either sub-population. Therefore, the conjecture is supported. When using an interdependent task, personal traits do not make an impact on perceptions of group members' performance. A summary of the residual chi-square test is given in Table 4.37.

Table 4.37

Relationship between Personal Differences and Perceptions of Another Member's
Performance when using Interdependent Tasks: Residual Chi-Square Test

Population	DF	Chi-Square	Pr > Chi-Square
Least Positive	7	5.23	0.6315
Most Positive	7	9.14	0.2427

**Relationship between Personal Differences and Perceptions of Another
Member's Performance when Task is Independent**

The sixth conjecture was “Independent tasks will increase the impact of another member's personal diversity in a group member's perceptions of another member's contribution to group performance”, and was also tested using Logit regression of the sample's two sub-populations based on report type with a William scale model. It was expected that personal diversity would have a negative impact on a student's performance evaluation when the task was independent, because there is not enough interaction to overcome negative stereotypes.

The score chi-square for testing the proportional odds assumption of the sample of reports of least positive experiences is 5.94, which is nonsignificant with respect to a chi-squared distribution with 7 degrees of freedom ($p=0.55$). Although also nonsignificant, the population of most positive group experiences had a much stronger probability (chi-square = 5.21, $p>0.63$). This indicates that a proportional odds model is appropriate for the data. No personal trait had a significant effect on overall performance at the $\alpha = 0.05$ level for either sub-population. Therefore, the

conjecture was not supported. When using an independent task, personal traits do not make an impact on perceptions of group members' performance. A summary of the residual chi-square test is in Table 4.38 below

Table 4.38

Relationship between Personal Diversity and Perceptions of Another Member's Performance when using Independent Tasks: Residual Chi-Square Test

Population	DF	Chi-Square	Pr > Chi-Square
Least Positive	7	5.93	0.5472
Most Positive	7	5.21	0.6344

Relationship between Task Contributions and Perceptions of Another Member's Performance when Task is Interdependent

The seventh conjecture "Interdependent tasks will increase the impact of another member's task diversity in a group member's perceptions of another member's contribution to group performance". It is expected that with increased interaction other members will base judgments of performance on a member's task abilities, skills, and behavior, rather than their personal demographic differences. Like the previous conjectures, the study used a logit regression of the sample's two sub-populations based on report type, using the Williams scale to adjust for the threat of overdispersion. A regression of task contributions on overall performance found several types of contributions with a significant impact at the $\alpha=0.05$ level for both sub-populations. The hypothesis seems to be supported.

Of the 6 task competencies tested, the 4 with significance in least positive group experiences were Interpersonal Skills, Knowledge, Technical skills, and Dependability,

in that ranked order of estimated impact on performance scores. In "most positive" group experiences, contributions of Technical skills, Creativity, Communication skills, Knowledge and Dependability were significant with Knowledge and Dependability's estimated impact almost tied. A summary of the regression can be seen in Table 4.39 below. Because the Logit model fits the variables to parallel lines, there are two intercepts.

Table 4.39

Relationship between Task Diversity on Perceptions of Another Member's Performancewhen using Interdependent Tasks: Summary of Logistic Regression *

Population	Variable	Parameter Est	Point Estimate	Chi-Square	Pr > Chi-Square
Least Positive	Intercept 1	-8.36		96.09	<0.0001
	Intercept 2	-3.21		32.74	<0.0001
	Interpersonal	1.30	3.67	4.48	0.0343
	Knowledge	1.76	5.83	6.65	0.0099
	Technical	2.28	9.76	11.86	0.0006
	Dependable	4.36	78.56	37.06	<0.0001
Most Positive	Intercept 1	-9.42		60.02	<0.0001
	Intercept 2	-3.42		117.66	<0.0001
	Technical	1.28	3.61	6.95	0.0084
	Creative	1.38	3.99	8.18	0.0042
	Communication	1.83	6.24	13.12	0.0003
	Knowledge	4.13	62.08	61.41	<0.0001
	Dependable	4.14	62.90	60.35	<0.0001

* In rank order of significance

For every task competency measure listed above, an increase in the task's score resulted in the member being more likely to have been rated as "best overall". The effect size of Dependability is notably large for both sub-populations.

The Goodness of Fit tests were high for Deviance but low for Pearson chi-square, which could signify overdispersion. The link function was checked and is

correct, so the regression was scaled to the Williams model. The Williams model estimates a scale parameter equating the value of the Pearson χ^2 for the full model to its approximate expected value (SAS, 1994, chapter 39 section 5.1). The residual scores are valid, and summarized in Table 4.40 below. The model explains 63% of variance when the group is a less positive experience, and 65% of the variance for most positive group experiences.

Table 4.40

Amount of model explained by Task Diversity on Perceptions of Another Member's Performance when using Interdependent Tasks: R-Square

Population	R ²	Max-rescaled R ²
Least Positive	0.5334	0.6338
Most Positive	0.5299	0.6460

A stepwise regression of task contributions on overall performance found 4 task competencies with significant impact in least positive experiences, and 6 with significant impact in most positive experiences at the $\alpha = 0.05$ level. Therefore, the conjecture was primarily supported. When using an interdependent task, task contributions will make an impact on perceptions of group members' performance. These tests imply that an increase in perceived task abilities correlates with an increase in perceived performance overall.

Relationship between Task abilities and Perceptions of Another Member's Performance when Task is Independent

The eighth conjecture “Independent tasks will reduce the impact of another member's task diversity in a group member's perceptions of another member's contribution to group performance” was also tested using a Logit regression of the sample's two sub-populations based on report type. It was expected that with the low interaction of an independent task, members would find it difficult to use task behaviors and abilities when judging a member's performance. Similar to interdependent tasks, several categories of task competency in relation to overall performance were significant at the $\alpha = 0.05$ level for both sub-populations. All six task competencies had significance in least positive group experiences. Technical skills were ranked with the lowest estimated impact, with Communication skills, Creativity, Interpersonality, Knowledge, and Dependability following in order. In most positive group experiences, only Creativity was not significant (although its probability $>$ chi-square = 0.07). Interpersonal skills, Technical skills, Communication skills, Knowledge and Dependability were in ranked order of impact on performance scores, which is almost the same ranking found for Interdependent tasks. Again, the direction of impact was positive. A summary of the Logistic procedure can be seen in Table 4.41 below. It seems that the eighth conjecture is supported.

Table 4.41

Relationship of Task Abilities and Perceptions of Another Member's Performance when using Independent Tasks: Summary of Logistic Regression *

Population	Variable	Parameter Est	Point Estimate	Chi-Square	Pr > Chi-Square
Least Positive	Intercept 1	-9.46		298.04	<0.0001
	Intercept 2	-4.09		132.35	<0.0001
	Technical	1.23	3.44	12.38	0.0004
	Communication	1.69	5.42	19.63	<0.0001
	Creativity	1.74	5.72	23.75	<0.0001
	Interpersonal	1.76	5.81	21.42	<0.0001
	Knowledge	3.23	25.36	72.80	<0.0001
	Dependable	4.00	54.84	105.38	<0.0001
Most Positive	Intercept 1	-8.87		60.03	<0.0001
	Intercept 2	-3.70		117.66	<0.0001
	Interpersonal	1.09	2.99	7.11	0.0077
	Technical	2.11	8.28	27.86	<0.0001
	Communication	2.84	17.10	47.89	<0.0001
	Knowledge	3.08	21.69	55.37	<0.0001
	Dependable	3.13	22.84	58.26	<0.0001

* In rank order of significance

Model fit was again determined by using the Williams scale model. A summary of R^2 is given in Table 4.42. This model explains 68% of the variance when the group

experience is less positive and 64% of the variance when the group experience is most positive.

Table 4.42

Amount of model explained by Task Abilities and Perceptions of Another Member's

Performance when using Independent Tasks: R-Square

Population	R ²	Max-rescaled R ²
Least Positive	0.5783	0.6790
Most Positive	0.5402	0.6368

A stepwise regression of task competencies on overall performance found 6 task contributions with significant impact in least positive experiences, and 5 with significant impact in most positive experiences at the $\alpha = 0.05$ level. Therefore, the conjecture was not supported. When using an independent task, task contributions will make an impact on perceptions of group members' performance.

Relationship between All Variables Using an Interdependent Task and Perceptions of Another Member's Performance

The relative importance of task to personal traits when using an interdependent task was measured using Logit regression of the full model. It was expected that task contributions would have more impact than personal traits. Again, the sample was split into two sub-populations based on report type. A regression of all traits on overall performance found several task competencies but no personal traits with a significant impact at the $\alpha = 0.05$ level for both sub-populations. For the sample reporting on

their least positive group experience, Dependability shows the greatest estimated negative impact, with Technical skills, Knowledge, and Interpersonal skills following. For the sample based on most positive group experiences, only one task competency did not have impact, which was Interpersonal skill. Again, Dependability had the largest estimated effect size, followed by Knowledge, Communication skills, Creativity and Technical skills. Again, the direction of impact was positive for both samples. Since there were no personal traits included as significant, the full model is the same as Table 4.39, given previously in this chapter. This regression may mean that task contributions do have more impact than personal traits when groups use an interdependent task.

A stepwise regression of all traits on overall performance found 4 task traits with significant impact in least positive experiences, and 5 with significant impact in most positive experiences at the $\alpha = 0.05$ level. Therefore, the full model was supported. When using an interdependent task, task traits will make more impact on perceptions of group members' performance than personal traits.

Relationship between All Variables Using an Independent Task and Perceptions of Another Member's Performance

The same tests used with interdependent tasks were repeated with independent tasks to determine the relative importance of task to personal traits. Using a Logit regression of the full model it was expected that personal traits would have more impact than task traits. Again, the sample was split into two sub-populations based on report type. Against expectations, but in line with this study's previous test of personal trait variables, no personal traits and several task traits were significant at the $\alpha = 0.05$ level for both sub-populations. For the sample reporting on their least positive group

experience, all task traits had impact on perceived performance of other members. Again, the direction of all effects was positive. For the sample based on most positive group experiences, only one task trait did not have impact, which was Creativity. Since there were no personal traits, the full model is the same as Table 4.41, given previously in this chapter. It seems that task traits do have more impact than personal traits when groups use an independent task on perceptions of another member's competency.

A stepwise regression of all traits on overall performance found 5 task traits with significant impact in least positive experiences, and 6 with significant impact in most positive experiences at the $\alpha = 0.05$ level. Therefore, the conjecture was not supported. When using an independent task, task traits will make more impact on perceptions of group members' performance than personal traits.

Summary of Development of Perceptions of Another Member's Performance

Using the same Social categorization and self-categorization theory base as before, students were expected to rate those members with high personal diversity lower. Interdependent group tasks were expected to moderate and diminish this effect. Logit regression supported the hypothesis that Interdependent tasks will reduce the impact of another member's personal diversity in perceptions of *another member's contribution to group performance*. " No personal traits were found to have significant impact on an observers perception of other group members' overall performance, no matter which type of task or group experience.

On the other hand, task traits seemed to have a strong impact on member performance scores. This was true regardless of task, and regardless of the type of

group experience reported (most or least positive). The type of task traits seemed to vary more according to the type of group experience than the type of task being used.

Relationship between Best overall member and the Worst overall member

Further tests were conducted to determine how those members that perceived themselves as the "best member overall" related to the member they rated as "worst member overall". In previous tests concerning perceptions of other group members, we were not interested in how the raters perceived themselves. In this third sample of the data, only those students that rated themselves as 'best' were included (N=181). Their perceptions of other members are tested in the same way as previous tests of perception, by using t-tests and regression with the logit model.

Relationship Between Type of Report and Task Type for members that self-report themselves as the best overall performer

The type of experience reported showed a significant and obvious difference in the type of group task used. Those experiences that were deemed most positive averaged 72 face-to-face hours for the group, while those deemed least positive averaged 37.5 hours face-to-face. Table 4.43 summarizes the t-tests by sub-samples of report type and hours face-to-face (measure of task interactivity).

Table 4.43

T-Test Analysis: Report Type and Task Interactivity

Task Type	N	Mean	Prob > T
Least Positive Report	107	48.55	$p < 0.0001$
Most Positive Report	74	72.007	

In both sub-populations (least positive or most positive experience) the members that report themselves as ‘best’ show a significant difference in the task type used by their group. In both sub-samples, students are more likely to rate themselves as the best performing member overall when the task is interactive ($p < 0.0001$). Table 4.44 summarizes the t-test which tested group task type (categorized as interdependent or independent) for each report type sub-sample.

Table 4.44

T-Test Analysis: Difference in Face-to-face interaction hours -Task Type by Report Type

Population	Task Type	N	Mean	Prob > T
Least	Independent	81	28.03	$p < 0.0001$
Positive	Interdependent	26	112.48	
Most	Independent	46	32.88	$p < 0.0001$
Positive	Interdependent	28	136.29	

The personal traits of those members that were rated “worst” by the self-selected “best” member were regressed using the logit model. Of note, no personal traits of the worst overall member, as perceived by the best performing member, is significant at the Alpha 0.15 level.

Frequency counts of task capability when member was rated as “best overall” and “worst overall”

As further analysis of why members might be perceived differently, the study explored the frequency of times a member was ‘voted’ or perceived as ‘best’ at a

capability when also voted as best overall member. Conversely, frequency counts of task capability votes reflect the times a member is perceived as 'least' or 'worst' at a task capability when voted as the worst member overall. The frequency tables for these charts are included in Appendix K.

Figure 4.4

Line Chart of frequency of task capabilities perceived as high for member voted best overall

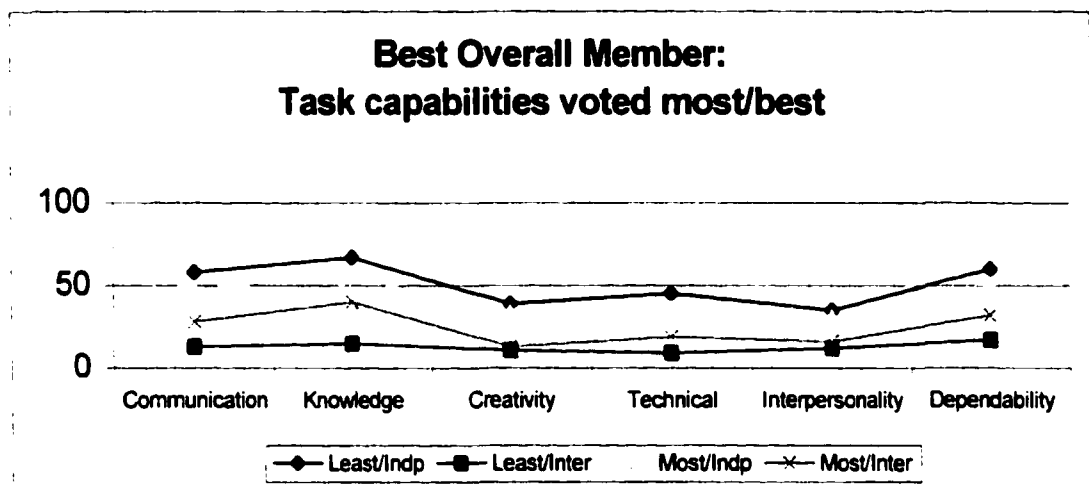
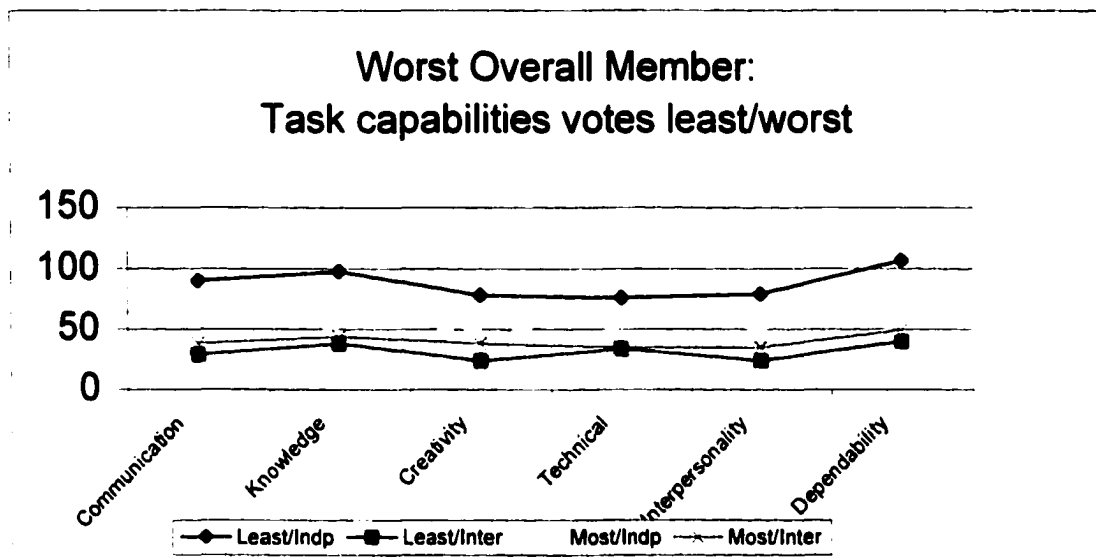


Figure 4.5

Line Chart of frequency of task capabilities perceived as low for member voted worst overall



No matter what population or task, the charts show that the task traits have the same direction and pattern. Those members that are most knowledgeable and dependable are most likely also considered best member overall, while those members that are considered least knowledgeable and/or dependable are most likely to be perceived as the least performing overall. This finding was also reflected by the point estimates of the Logit model regressions on overall member performance.

The different levels for each line in the frequency charts reflect a difference in the number of the overall population for each sub-population. The frequency counts do show that for members voted “best overall” there is little task trait differentiation when the task is interactive and the group experience was least positive.

Chapter Five: Discussion of the Results

Introduction

The results reported in Chapter 4 provided insight about perceptual processes that occurred within diverse groups as members were required to work interactively rather than independently to complete assignments. In this chapter, these results are interpreted within the context of the study's research questions, which are grouped into two major issues: 1) The extent to which the type of task impacts perceptions of the group learning experience and 2) the extent to which the type of task impacts perceptions of other members' performance. The model of the relationship between member attributes, the group task, and perceptions of competency and learning experience (See Figure 3.1) is revised. Limitations of the research design are addressed and suggestions for future research are offered.

Terms and Definitions

Before the research questions are addressed, it is important to recall the terms and definitions that provided the foundation for the measures used in this study. The purpose of this study is to empirically examine the importance of tasks that are involved in the completion of group assignments and how, if at all, the nature of these tasks mediate students' attitudes towards working in diverse groups.

Diversity is the different categories individuals use to describe themselves and others. These categories are needed for the differences among group members to be attributed and measured by other members. *Social perception* allows us to examine the traits of the evaluating member, as these may impact the way competence is

determined. Finally, *social categorization* is how a group member is categorized, or in this study, the way a group member's competence is perceived.

Diversity in this study was measured as two types: personal and task. *Personal diversity* is defined as differences among group members in attributes that are generally immutable, almost immediately observable, and measurable in simple and valid ways (Jackson, et. al. 1995). Personal diversity correlates to the surface level of attribution defined by Harrison, et.al. (1998). This study used common demographic attributes as measures of personal diversity. A different type of diversity is used to measure task competence. *Task diversity* is defined as differences in non-visible attributes communicated by verbal and nonverbal behavior patterns, which are ascertained by extended interactions and information gathering. Therefore, task diversity correlates to a deep level of attribution (Harrison, et. al., 1998). This study focused on task attributes concerning the knowledge and skill traits that determine a member's competence on group tasks. These non-visible attributes are more likely to be essential to task success than personal traits, and with increased interaction should be more important in perceptions of group and member outcomes.

Perception is a belief concerning the attributes of others. Usually, why a person behaves a certain way is not directly observable, so others must depend upon their own cognition, or perception, to attribute motivation to observable behavior (Luthans, 1995, p. 162). Accordingly, the attribution(s) members make about others or the learning environment is expected to influence group processes and outcomes. This study investigated the relationship between perception of member attributes, task type, and perceptions of the group learning experience or other members' performance.

The Perception of Group Learning Effectiveness

The objective of the first research question was to determine the extent to which the type of task impacts a member's perceptions of the group learning effectiveness, and if so, to what extent diversity impacts those perceptions. This was a worthwhile objective for two reasons. First, the results of a study that measures both the diversity of groups and the interaction level of assigned tasks may help resolve the debate of whether groups are an effective learning tool. To date, the experiences of instructors and the results of studies regarding group outcomes and perceived experiences are mixed. Secondly, by determining if member diversity has an added impact on group learning effectiveness, instructors in higher education can develop appropriate assignments for groups in an increasingly diverse student body.

In some groups, assignments such as writing papers or analyzing large business cases lend themselves to dividing the work between members. The task is completed in parts and then "put together" at the end. Other tasks, such as group tests, require interaction between members. The members share information as they decide between alternate choices and make decisions interdependently. Those tasks that require interaction often require face-to-face group work, but members can work alone to independently complete divisible tasks.

To determine the impact of task interactivity on a member's perceived learning experience, the number of hours spent as a group face-to-face was measured. The more hours members spent together, the higher the probability of task interaction. If the face-to-face hours were above average, the group was classified as interdependent, while those below average were classified as independent.

A member's perception of the effectiveness of group learning was measured using the average of three questionnaire items whose scale ranged from 1 to 5. The three questions, which had high inter-item reliability, surveyed perceptions 1) of overall assessment of group work, 2) that groups enhance learning class material, and 3) that groups enhance a member's collegiate education. Students were surveyed using two different instruments with identical questions. One asked the student to describe their least positive group experience, while the other asked them to describe their most positive group experience.

Interdependent tasks lead to positive perceptions of group learning

Members of groups that completed interdependent tasks had a more positive perception of group learning effectiveness than members assigned to independent tasks. Before splitting the populations equally according to "Most" or "Least" positive report types, interdependent tasks led to a mean learning effectiveness score that was 19.4% higher than independent tasks. After the sample population was divided into two sub-groups by type of report, interdependent tasks were approximately 12-13% higher and more significant than independent tasks. This impact is more pronounced for the sample population reporting on their most positive experience than for students reporting on less positive experiences.

A basis for higher perceptions of group learning effectiveness when task interaction is higher is suggested by literature in group dynamics. Two meta-analyses from the literature suggest high task interactivity may result in positive group outcomes. Gully, Devine and Whitney (1995) concluded that task interdependence strongly affected the strength of group cohesion (which in turn is associated with positive group

outcomes). Another meta-analysis of 98 studies found that cooperative learning experiences promote greater interpersonal attraction among heterogeneous and homogeneous members than do competitive or individualistic learning experiences (Johnson, et al., 1983). Outcomes of both studies – cohesion and interpersonal attraction – would be expected to lead to higher perceptions of learning effectiveness. In addition, the higher level of interactivity for tasks in the “most positive” sample support Johnson & Johnson’s (1989) conclusions that group learning may give members more feelings of stimulation, enjoyment, trust, and increased self-esteem.

Empirical findings for null hypothesis one strongly suggest that interdependent group tasks are more effective for learning than independent group tasks. Even in a “problem” group – captured by our sub-sample of least positive group experiences – an interdependent task led to increased learning effectiveness. Frequency statistics show most of the surveys of interdependent tasks were in the “most positive” sample, and the majority of independent task surveys were in the “least positive” sample. This is further support that interdependent tasks lead to more positive attitudes towards working in a group setting.

These findings partially explain why instructors’ anecdotal experiences with groups are inconsistent. When results and outcomes are mixed, the answer may be the type of task. Positive results and higher learning effectiveness is more likely with an interdependent task. This occurs because tasks that require face-to-face interaction convey a more complete exchange of member information. The more members get to know each other, the better information they have to make group decisions. In addition

to better information, familiarity helps group members overcome the problems of generating consensus (a type of group process loss).

Although group learning has been adopted as a valuable and efficacious teaching method, there has been limited empirical research that examines the impact of using learning groups on a student's perceptions of the learning experience. From these findings, it seems that even in groups that are considered to be a poor experience, interdependent tasks lead to higher evaluations of group learning effectiveness.

Effects of diversity on perceptions of group learning

In addition to determining task type's influence on perceptions of group learning, analysis was conducted to determine the extent to which a member's personal or task diversity determines perceived group learning effectiveness. It is appropriate to discuss member diversity and categorization within the context of this first research question because findings provide relevant insight as to why a diverse member's assigned group task affected their learning experience. The impact due to task type differed when a member was personally and/or task diverse.

A student's diversity score was measured as the difference between them and their group on personal traits, and by contrasting their scores on task competence measures. Analyses were conducted to determine which type of diversity (personal or task) was most likely to matter when task type varied. An advantage of this study's sample of learning groups is that it captures the group composition of institutions of higher education, while most other research has been limited to elementary school situations. Tests of diversity's impact split the sample population into two sub-samples based on the type of experience being reported (most vs. least positive).

Personal Diversity in interdependent groups has mixed impact on learning effectiveness

Ethnicity, age, race, class standing and English fluency had mixed impact on perceptions of group learning effectiveness. Personal, demographic traits were regressed against learning effectiveness using categories of independent and interdependent tasks. Several personal traits impact the perception of group learning effectiveness when using interdependent tasks – especially in a less positive group experience. For poor experiences, if a group member's ethnicity or age (compared to the group) is more diverse, they tend to evaluate the effectiveness of group learning more positively. Conversely, when a group member's racial diversity or difference in class standing is greater than their group, group learning effectiveness is evaluated lower.

Ethnic diversity explained the most variance in the model and had the most significant impact on learning effectiveness scores of poor experiences. The amount of ethnic diversity required to make a one point change in the intercept of learning effectiveness of 3.73 was 1.12. On the other hand, it only took a 0.32 change in age diversity to shift the learning effectiveness score by one point.

In positive experiences, personal diversity was much less of an issue and had less impact on perceptions of group learning effectiveness. When group members use interdependent tasks in a generally positive group situation, only English fluency is an important demographic factor in perceptions of learning effectiveness. As English fluency diversity increases (meaning the member's fluency is dropping) the perception of group learning effectiveness decreases.

Personal Diversity in Independent groups has little impact on learning effectiveness

When using independent tasks it was expected that several personal diversity scores would have a negative impact on scores of a student's perception of learning effectiveness, but only least positive group situations showed impact from personal diversity. Although the size of the effect was very small (3% total when controlled by group consistency), those students whose race or gender were more diverse than their group perceived group learning effectiveness as higher when they were not required to interact.

Summary of personal diversity's impact for both types of task

None of the individual dimensions of personal diversity explained more than 6% of the variance of the model. Of note was the direction of racial diversity, which was negatively correlated to learning effectiveness for both categories of task. In most positive group experiences, race is not an issue, but in less positive group experiences it explains 3% of the model when using interdependent tasks and 1% of the model when using independent tasks. Race was the only personal trait that negatively correlated to learning experience despite increased face-to-face interaction. These results seem to suggest that negative racial stereotypes are not easily overcome.

Task competency in interdependent groups has little impact on learning effectiveness

It was expected that scores for several types of task competency would have an impact on a student's perception of learning effectiveness when using an interdependent

task, but this was only true for the score of dependability when a member was reporting on their least positive group experience. While significant ($p=0.0838$) the effect size of dependability only explained about 4% of the model's variance (partial $R^2 = 0.0427$). The group members that rated themselves as least dependable in the group tended to view group learning effectiveness more highly than those that felt they were most dependable. Task competencies were not significant for the sample of most positive group experiences.

Task competency in independent groups has mixed impact on learning effectiveness

Members in groups with low opportunities for interaction were not expected to base their perceptions on task competency or contributions, which take time to determine. The hypothesis was supported for the sample reporting on least positive experiences. In the sub-sample of poor group experiences, task traits showed no impact on a student's perception of learning effectiveness. For group experiences that were most positive, interpersonal skills were found to impact learning effectiveness scores at the $\alpha=.15$ level of significance, but only explained about 1.76% of variance in the model. The higher a member's interpersonal skills, the more positively they perceived group learning effectiveness.

Background on task type's impact on perceptions of group learning

Self-categorization explains why members with high personal diversity (as compared to their group) may value a group learning experience more highly when the task is interdependent. Interdependent tasks give personally diverse members a chance

to “prove” themselves on other, more salient characteristics such as ability and knowledge. Especially when the overall group environment is poor, perceptions are more likely to be based on personal trait diversity and the interdependent task has more impact. When the group experience is ‘most positive’ the effect of a member’s personal traits when evaluating the group learning experience is diminished, perhaps because other positive elements give the groups added resources or ‘slack’. Less positive experiences seem to have less slack in the overall environment of the classroom or group, making the task itself a more important element in the perception of learning effectiveness.

An interesting finding for least positive experiences is that racial diversity does not respond positively to increased face-to-face group time no matter the type of task. In other words, those members that are racially diverse did not perceive extended time together as a group as effective for learning. The sample demographics imply that racially diverse (students that are non-White) students would prefer either homogeneous groups (consisting of minorities) or working alone.

The literature regarding racial minorities in groups has been mixed. Marvin Shaw (1980) noted that the feelings and behavioral differences in racially diverse groups sometimes, but not always, negatively interfered with group performance. Li, Karakowsky & Siegel (1999) found that members who were a racial minority (Asian) in a 30 minute task tended to be passive, introverted, alienated, withdrawn, and participate less in the discussion. On the other hand, Johnsons’ studies (1981, 1982, & 1983) found that racial minorities kept in long-term groups had positive outcomes.

An explanation of the study's findings and the mixed results of the literature could be explained by the type of interdependent task being used. Tasks that require higher face-to-face time as a group may give more opportunity - but not require - cooperation and interdependency. It could be that the racially diverse student can still achieve a satisfactory course grade without the group's help or high regard. In this case, a racially diverse member has less motivation to overcome their natural tendency to withdraw from the group. Racial diversity was not significant in surveys of 'most positive' group experiences.

The other dimension with an effect in the opposite direction than anticipated was class standing. In least positive group experiences, if a student is not at the same level of education as the group, the learning effectiveness of group work is perceived to be lower. In this sample, students with diverse standing with respect to the group were likely to be lower classmen in a group of seniors. This finding may be a result of the cumulative nature of a college education rather than a measure of status. In other words, class standing most likely is directly related to ability. A perceived or real lack of ability probably colors perceptions of learning effectiveness negatively.

When the overall experience was positive, all effects of task diversity except those of fluency dissolved. For non-fluent members, additional face-to-face interaction does not correlate to increased information exchange. A normal assumption is that a lack of fluency is a major barrier to divulging information about oneself to other members, resulting in a low exchange of information on the more salient task traits. When a low-fluency member is in a situation where communication is critical to performance (such as an interdependent task) the group experience is bound to be less

positive. The extended time with the group may highlight their lack of communication and understanding rather than overcome their language skill difficulties. Anecdotal evidence suggests non-fluent members would rather split the group assignment up, take their portion, and complete it without interaction. This statement is empirically supported by this study since members with low fluency perceived learning group effectiveness less positively.

Conclusions about Task type's impact on learning perceptions

To date, much of the research on diversity has examined the effects of individual characteristics, such as race and sex, on student attitudes and perceptions in ad hoc studies (Johnson & Johnson 1975, 1981, 1982; Johnson, et al., 1983). Recently, however, some researchers have indicated that diversity research must go beyond demographic variables and consider deeper factors of diversity and context, such as personality traits (Harrison, Price & Bell, 1998) or situational variables such as interaction and tenure (Kumar, Watson & Michaelsen, 1993). This study combined two levels of group diversity with the mediating variable of task interaction.

This study furthered the body of literature by examining personal demographics, member's task competency, and the level of interaction of student learning groups. Individual demographic variables alone may not adequately reflect the full impact of diversity within the class setting, especially when those students work within a social context such as a learning group. An important contribution of this study is its examination of student personal and task diversity within the context of their social environment, i.e.: learning groups.

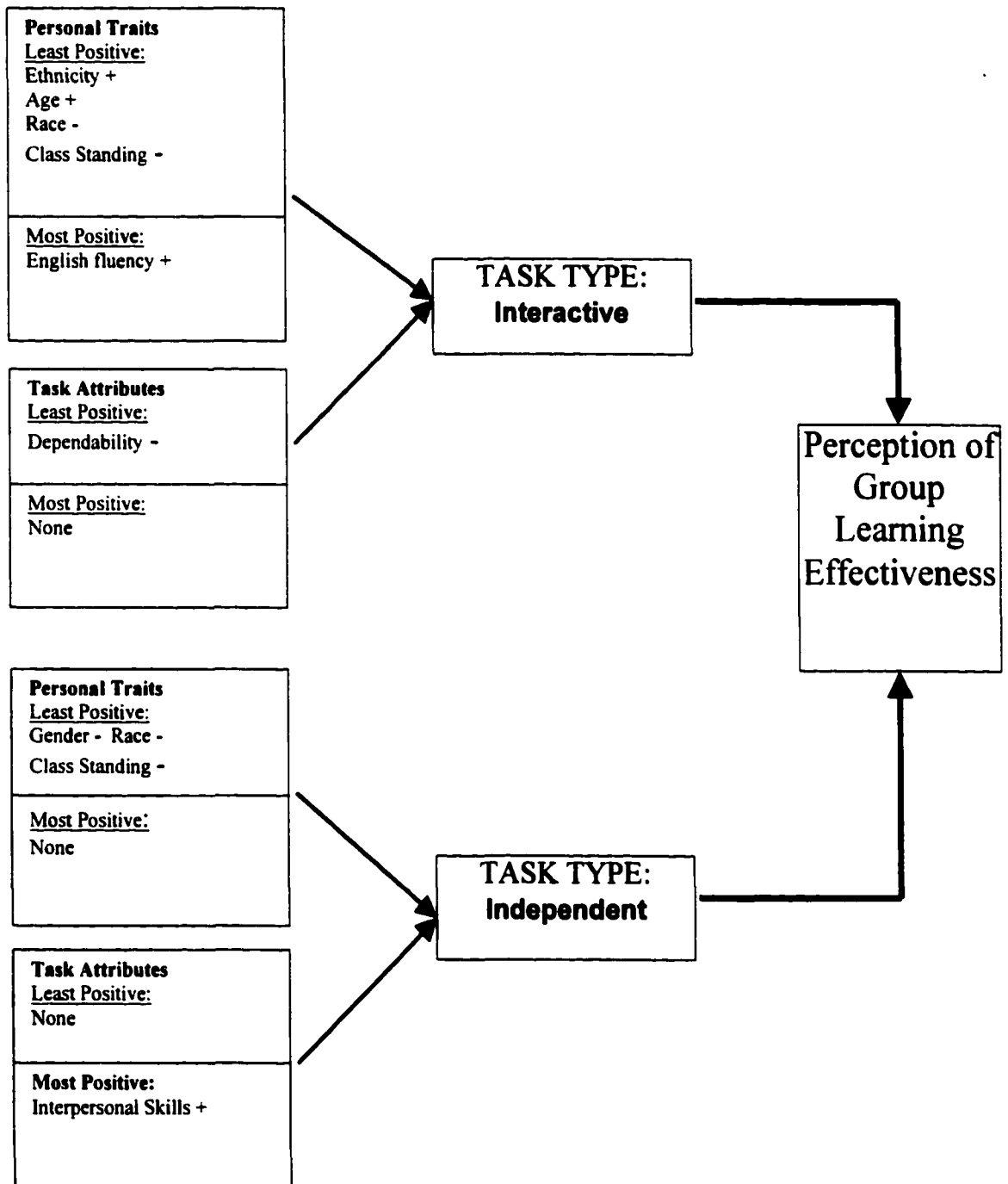
Task interdependence is an important mediating variable in a member's perception of group learning effectiveness. No matter what type of overall experience they were asked to report (least or most positive) those members involved in interdependent tasks had higher perceptions of learning effectiveness in groups.

Including personal and task diversity into the model produced small, but mixed, findings. Factors of diversity had more impact when the group experience reported was less positive. Ethnic diversity explained more of the variance of the model than any other type of diversity. Negative effects of ethnic diversity were overcome and reversed by interdependent tasks. Negative effects of racial diversity on perceptions of learning effectiveness were not overcome by either independent or interdependent tasks.

A revised model of significant variables is shown in Figure 5.1 below.

Figure 5.1

The importance of the nature of the task to member's perceptions of learning experience



Implications of the Findings

Up to now the debate over the efficacy of group learning has not included the mediating variable of group assignment. The findings of this study imply that interdependent tasks improve perceptions of group learning effectiveness. Even in groups that were considered the least positive in a member's history of group work, interdependent assignments led to significantly higher scores of group learning effectiveness than groups using independent assignments.

Task diversity: classroom solutions

To promote positive perceptions of group work, tasks should require or encourage face-to-face time together. One clear method of encouraging face-to-face interaction is to give class time for group work. Another is to assign group tasks that require a consensus decision within the class period. Finally, assignments should not be of the type that can be completed by one member or divided amongst members, and completed alone. Groups should be kept intact for the duration of the class period, as implied by the impact of the control variable 'group consistency'.

Personal diversity: classroom solutions

Personal (or demographic) diversity within the group can also impact perceptions of group work. Many educational institutions face changes in the demographic composition of the student body due to globalization, social trends, and demographic realities. Diverse groups are used much more frequently as instructors try to better model and teach business concepts in a realistic way. As a result of changing student composition and teaching techniques, instructors are encountering problems in

students' perceptions of evaluation, fairness-and the value of learning in groups.

Although mixed, findings concerning diversity's impact on learning effectiveness imply some classroom solutions related to member perception of group effectiveness.

A sufficient number of hours spent face-to-face implies, but does not necessarily mean the group task *was truly* interdependent in nature. Increased hours face-to-face did not always overcome group problems caused by race, language, and class standing difficulties. Increased interaction does give more opportunity for cooperation and information exchange, alleviating the problems caused by a member's diversity in ethnicity, age or English fluency. While tasks that increase the hours spent face-to-face encourage cooperation, which leads to increased perceptions of learning effectiveness, they do not *require* cooperation. Therefore, some diverse members -- especially those that are racially diverse, may still tend to withdraw from the group's exchange of information.

Finally, the overall environment in which the groups are taught is critical. The findings of diversity's impact on perceptions of learning effectiveness were mixed, mainly due to the type of group experience being reported (least vs. most positive). This implies another mediating variable in addition to type of task. There are many components other than the type of assignment or group composition that can make a group learning experience less positive. The instructor's personality, the method of group formation, the content of the course, the environment of the building and other elements can combine and affect the group learning experience. Further study into elements of the general classroom environment such as instructor feedback, grade weights, and type of group conflict, among others, is needed.

Task type's impact on perceptions of other member's performance

The objective of the second research question was to determine the extent to which the type of task impacts a member's perceptions of another member's performance, and if so, to what extent that other member's diversity colors those perceptions. The second half of this study was driven by the same objectives as the first half. Like the debate on the effectiveness of group learning, there is mixed anecdotal and research evidence on whether students in groups give fair evaluations of other member's performance. As mentioned before, instructors are encountering problems in students' perceptions of evaluation and fairness in groups. Secondly, by determining if diversity additionally has an impact on another member's performance evaluation, instructors in higher education can develop more appropriate evaluation and feedback tools for groups in an increasingly diverse student body.

The second research question asks "Does the type of task have an impact on perceptions of another member?" To statistically test this research question each member reported on the survey became a single observation. Perception of member competency was measured by giving values to observations that were chosen as the 'best' member (obs. = 1) and 'worst' member (obs. = 0). Members not chosen were given a neutral value (obs. = 0.5). This study uses an extension of the logit model that allows a choice between more than two alternatives and deals with ordered alternatives to statistically test the significance of members' diversity and performance.

Task competencies have strong impact on perceptions of other members

As mentioned, the population studied was different for the second research question, since every group member, not just the respondent, was included. Due to the

design and method of measuring perception of performance, the perceived performance score no matter what task type should average 0.50. A T-test was used to measure the assumption that there was no difference in means between task type categories. An unexpected finding is that independent tasks resulted in slightly higher perceptions of other group members than interdependent tasks. There was a very low level of significance ($p=0.26$) that the means of the overall performance score for independent tasks ($\mu=0.496$) were significantly higher than those of interdependent tasks ($\mu=0.479$).

Although there was little difference in perceptions of another member's performance when mediated by type of task, the control variable of type of experience being reported seemed to impact another member's performance score significantly. The average hours spent face-to-face were significantly different between the population reporting on their least positive experience and the population reporting on their most positive experience ($p>0.0000$). Least positive group situations averaged 47 hours face-to-face, while groups in most positive situations averaged 79 hours face-to-face. Performance scores from the population of least positive group experiences were lower ($\mu=0.47$) than those from most positive experiences ($\mu=0.51$). Using a paired t-test, the probability that the two samples' means are distinct is $p=0.02$. In addition, interdependent tasks were used almost two times more in the sample of most positive group experiences (407 interdependent observations) than the least positive group experiences sample (213 interdependent observations). Therefore, further tests of task type and performance scores were again split into subpopulations based on least and most positive report types. No other control variable had any significant impact on the model to measure perceptions of other member's performance.

The sample consisting of less positive group experiences rated other group members slightly lower than the sample of most positive group experiences. The sample of most positive group experiences – which contained the most interactive tasks - chose a “Best Overall” member, or refrained from choosing a “Worst Overall” member more often than observers involved in less positive group experiences. It seems natural that other members of the group were perceived more positively in group experiences that were considered the most positive in a student’s history.

Despite the task, personal traits have no impact on another member’s perceived performance

The fifth conjecture was “Interdependent tasks will reduce the impact of another member’s personal diversity in perceptions of another member’s contribution to group performance. Using d _scores to measure personal trait diversity, no personal traits were found to have significant impact on performance scores at a significance level of $\alpha=.05$ for either sub-population. Therefore, the conjecture is supported. When using an interdependent task, personal traits do not make an impact on perceptions of group members’ performance.

The sixth conjecture was “Independent tasks will increase the impact of another member’s personal diversity in a group member’s perceptions of another member’s contribution to group performance”. No personal trait had a significant effect on overall performance at the $\alpha = 0.05$ level for either sub-population. Therefore, the conjecture was not supported. When using an independent task, personal traits do not make an impact on perceptions of group members’ performance.

Despite the task, differences in task competency lead to positive perceptions of another member's performance

Seventh conjecture "Interdependent tasks will increase the impact of another member's task diversity in a group member's perceptions of another member's contribution to group performance" seems to be supported. For less positive group experiences, Interpersonal Skills, Knowledge, Technical skills, and Dependability positively impacted perceptions of other member's performance. In the sample of "most positive" group experiences, Technical skills, Creativity, Communication skills, Knowledge and Dependability were positively correlated to perceptions of another member's performance. In other words, members rated highest on these skills were more likely chosen as "Best Member Overall". When using an interdependent task, task traits will make a positive impact on perceptions of group members' performance.

The eighth conjecture "Independent tasks will increase the impact of another member's task diversity in a group member's perceptions of another member's contribution to group performance" was again supported. All six task traits had significance in least positive group experiences. In most positive group experiences, only Creativity was not significant. The other five task traits were positively correlated to another member's perceived performance.

Differences in Task competency have more impact than personal diversity on Perceptions of Another Member's Performance when using Interdependent Tasks

While several task diversity traits had impact on the dependent variable of perceptions of a member's performance, personal diversity had no significant impact.

For the sample reporting on their least positive group experience, Dependability shows the greatest estimated positive impact, with a point estimate of 78.56. Comparatively, the next most influential task competency is Technical skills with a point estimate of 9.76, followed by Knowledge and Interpersonal skills. For the sample based on most positive group experiences, Dependability again had the largest estimated effect size (4.14) but Knowledge was a close second (4.13). Dependability and Knowledge both had point estimates (63 & 62, respectively) that were much larger than the point estimate of Communication skills (6.24), Creativity (3.99) and Technical skills (3.61). Task traits explained around 64% of the model's variance no matter what group experience was being reported.

It seems that task traits do have more impact than personal traits when groups use an interdependent task. Of these task traits, a member's Dependability and Knowledge explain the greatest variance in the model, no matter what type of group experience is being reported.

Differences in Task competencies have more impact than personal diversity on Perceptions of Another Member's Performance when using Interdependent Tasks

Several task traits enter the model, but no personal traits have significant impact in either sub-population when examining groups using interdependent tasks. For the sample reporting on their least positive group experience, all task traits had impact on perceived performance of other members. For the sample based on most positive group experiences, only one task trait did not have significant impact, which was Creativity. Again, the direction of impact of task traits was positive.

Although the impact of Dependability was weaker when reporting on less positive experiences, this task competency's impact was again much stronger than the other task competencies (see Table 4.39). Knowledge has much more impact in a positive rather than in a less positive situation. In least positive group experiences, physical presence, or dependability, seems to be the most salient measure of member performance.

It seems that task traits do have more impact than personal traits when groups use an independent task on perceptions of another member's competency. Type of task seems to have little or no mediating effect on perceptions of another member's performance.

Summary of task competency's impact on member performance

Dependability was consistently shown to be the best predictor of perceived member performance. Of interest is that Dependability is considered a much more desired task competency when the group experience is less positive than when the experience is most positive. Another skill that is deemed more important in less positive and/or independent groups is Interpersonal skills. When the task is interdependent and the experience is positive, interpersonal skills have no impact on a member's perceived performance. Creativity may require either slack resources or desperation in the group to have impact. For example, when the experience is positive, creativity has impact if the task is interdependent. When the experience is negative, creativity has impact if the task is independent. Finally, Communication seems to have more impact when the experience is positive, especially if the task is interdependent.

Members more likely to self-report themselves as "best" when using interactive tasks

Further tests were conducted to determine how those members that perceived themselves as the "best member overall" related to the member they rated as "worst member overall". In both sub-populations (least positive or most positive experience) the members that reported themselves as best showed a significant difference in task type. In both populations, students are more likely to rate themselves as the best performing member overall when the task was interactive ($p < 0.0001$). Of note, no personal traits or task competencies of the "worst performing" member, as compared to the best performing member, is significant at the 0.15 level.

Summary of Development of Perceptions of Another Member's Performance

Based on the Social categorization and self-categorization theory, students were expected to rate those members with high personal diversity lower. Interdependent group tasks were expected to moderate and diminish this effect. Results from Logit regression supported the hypothesis that Interdependent tasks will reduce the impact of another member's personal diversity in perceptions of *another member's contribution to group performance*. " No personal traits were found to have significant impact on an observer's perception of other group members' overall performance, no matter which type of task or group experience.

On the other hand, task traits seemed to have a strong impact on member performance scores. This was true regardless of task, and regardless of the type of group experience reported (most or least positive). The type of task traits seemed to

vary more according to the type of group experience than the type of task being used.

When groups are assigned interdependent tasks, a member's dependability consistently and significantly impacts their perceived performance.

Implications of findings concerning member perception

Social categorization proposes that individuals use diversity as a basis to compare their own demographic characteristics with those of others in their social units to determine if they are similar or dissimilar in their demographic characteristics to the composition of the unit (Tsui, Egan, & O'Reilly, 1992; Tsui & O'Reilly, 1989). The level of an individual's similarity or dissimilarity in either personal or task characteristics to the composition of his or her learning group is proposed to affect the individual's work-related attitudes. The comparison between the student and their groups is proposed to be more accurate when interaction between members is increased and additional information is acquired.

Initially, group members only have information about each other that is obvious to the senses. As interaction is increased, information on less visible, but more meaningful member traits is acquired. Perceptions of members are therefore dependent on the level of information acquired, which depends upon the level of group interaction. This study proposed that interdependent tasks shift the basis of perceptions of other members from easily and spontaneously detected personal demographic traits to less observable and more inferred task traits. Previous studies of diversity's impact in groups found mixed results. This study is unique in that it includes interaction as an important factor of diversity's impact on group members' perceptions.

Perception was measured by linking measures of personal traits and task competence to performance scores. Unlike most diversity studies, it is not measuring the gap between perception and objective measures of performance, but is interested only in perceptions concerning the group members or others. Therefore, measures were limited to perceptions of traits and behaviors of group members.

The type of task was not found to have a mediating effect on perceptions of other members. Whether the task was interdependent or independent, members' task competency (task behavior and ability) had the most impact on their perceived performance. On the other hand, a member's personal traits had no significant impact on their perceived performance.

A straightforward assumption from these findings may be that student evaluations are based on salient factors and are not colored by negative stereotypes or demographic prejudices. Yet, the difference in task competencies that were significant and their impact according to type of group experience reported suggest that the issue is more complex.

Issues of Measurement

The unique advantage of the sample for this study is that it dealt with groups in institutions of higher education. By surveying a large number of students on their 'most' and 'least' positive group experiences, it included many different types of groups and tenure, as well as types of institutions and assignments. Some of the groups were formed under instructors that were well versed and experienced in learning groups, and some were simply ad hoc groups formed for the purpose of a short-term task.

Another advantage of this study is its large number of observations. Even after splitting the original sample into two subpopulations, the number of observations is large enough to give power and strength to the findings.

To capture extremes of perception, this study randomly assigned the sample into two sub-populations by asking for the 'most positive' and 'least positive' group experience. In so doing, it may have forced some members to report an overall positive experience as 'least positive' and vice versa, a poor experience as 'most positive'. In fact, the survey asked the student why they selected the group they were reporting as least or most positive, and a few responses were "it was the only one I remember", or "this is the only group I've been in". Therefore, even though seniors were surveyed so they would have a higher history of groups to choose from, some had only had one group experience. Future studies should ask for the number of groups in which a student has been a member to control for the student's level of experience with group work.

As mentioned before, an increased number of hours face-to-face provides members the opportunity to interact and exchange information, but does not necessarily require such interaction. It is uncertain that groups that spent more than the average number of hours together were actually working interactively on a task. Although data concerning specific tasks and the number of times they were assigned was also collected, (such as group exams, case studies, class presentation, written reports, etc.) different instructors, as well as students, define the terms differently. For some instructors, a case study may entail a group exercise that requires a consensus and decision from the group during class, while for others, it may be a project that is actually-split apart and completed by members individually. Therefore, the specific

group assignment was not sufficiently controlled to use as a measure of task interaction. Instead, face-to-face group hours are used as a proxy measure of group interaction.

In addition to better control of the nature of actual assignments, the mediating variable 'type of task' could be better operationalized by adding a third category that encompasses Thompson's (1967) concept of serial interdependence of tasks. In Thompson's model, there is middle ground between totally independent tasks (accomplished alone) and interdependent tasks (primarily a group decision). Many tasks require that task Z follows Y which in turn must wait for task X, etc. Any disruptions to the linking arrangement would be expected to have repercussions on subsequent tasks (Dick, 2001).

The aspect of serial interdependence is slightly different from Wood's aspect of coordinative complexity (1986). Serial interdependence relates to student tasks that require waiting on other tasks, such as the need to complete the research or analysis on a case before a solution or implementation plan can be suggested. Component complexity, on the other hand, is concerned with the way the task is completed, such as the degree of information required for the group to make a quality decision. It is likely that some of the hours this study categorized as 'independent' and 'interdependent' were actually stages in serially interdependent tasks.

To clearly measure perception, this study asked students to rate the group member that was 'least' and 'worst' or 'most' and 'best'. This produced dichotomous variables for task trait variables. This study included a 'neutral' value for members not rated, creating polychotomous variables with ranked order. The intent of this type of measure was to promote and capture responses on the extremes of perception rather

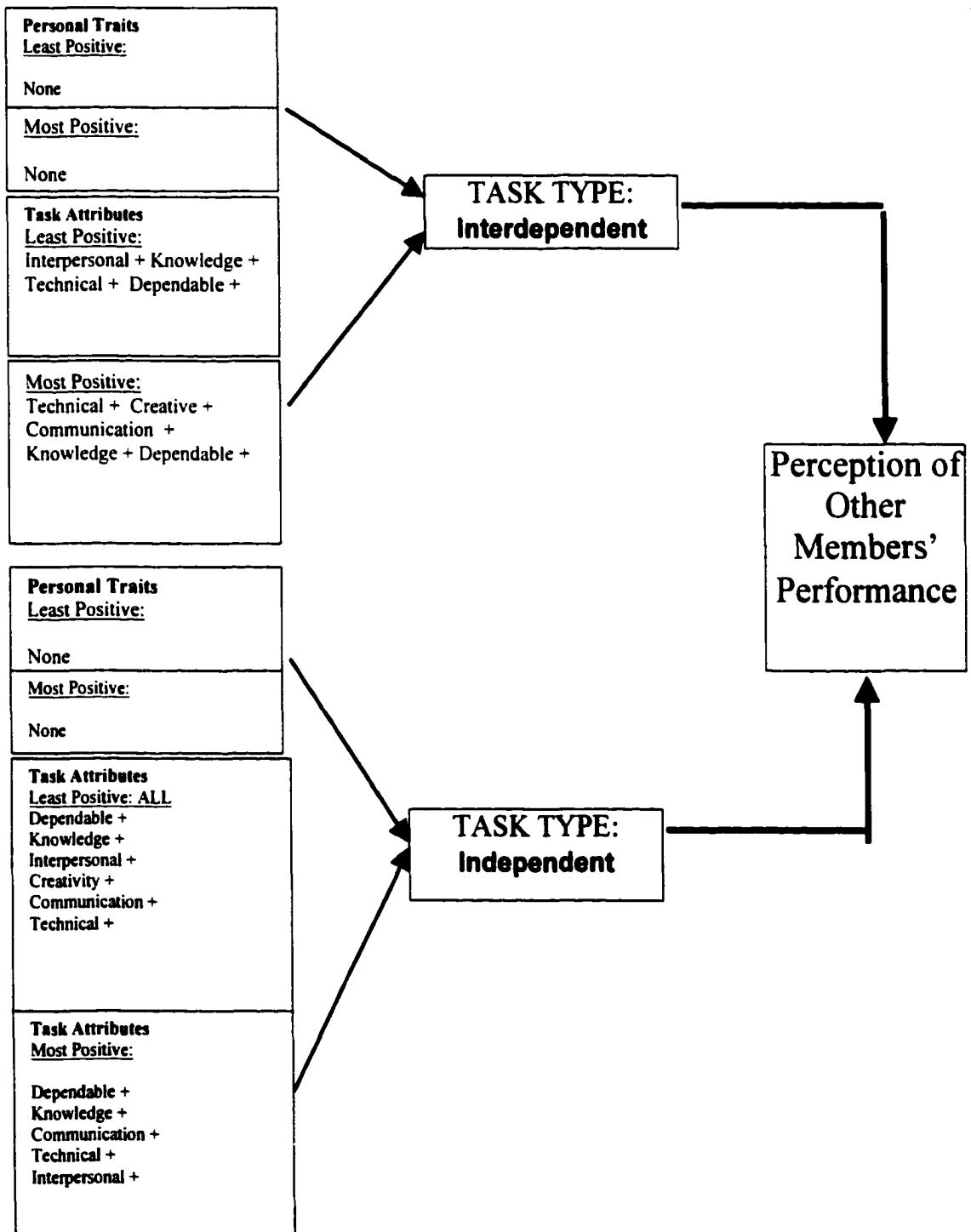
than allow the respondent to avoid making uncomfortable value judgments. On the other hand, this measure may not have been sensitive enough to capture the true implications of performance..

The same lack of sensitivity in measure may be true for the scores given “task diversity”. To measure a member’s task ability, this study asked students to rate the group member that was 'least' and 'worst' or 'most' and 'best' on a certain task trait. Again, non-rated members were given neutral values, resulting in polychotomous variables with ranked values of 0 (least), 0.5 (unrated/neutral), and 1 (best). An additional loss of sensitivity in measure may result when the sum of hours spent face to face is split into two categories - above average (interdependent) and below average (independent). These two categories are gross measures of the concept of task.

Although a clear difference between the two categories does emerge, there may be a threshold of hours spent together at which benefits or disadvantages of learning effectiveness truly take hold. Frequency graphs of the data were linear rather than quadratic, (See Figure 4.2 and 4.3) which do not indicate such a threshold.

Figure 5.2

The importance of the nature of the task to member's perceptions of other members' performance



Limitations of the study

The fact that this study measured real student learning groups in the actual context of their environment (institutions of higher education) has been a major strength when reporting findings, but may limit its ability to generalize to practical concerns of business management. It may be that the assignments given to students do not mirror the tasks of actual work groups.

When examining perceptions of others, polychotomous measures may not have been sensitive enough to capture true perceptions of deeper levels of diversity such as task competency. In addition, polychotomous measures were intended to average 0.5 when measuring perceptions of a member's performance. Rather than measuring true perceptions of performance, it is possible the study measured a regression toward the mean.

Further Study for factors in group learning effectiveness

The amount of variance attributed to type of report indicates another variable or set of variables in the model of perceptions of learning effectiveness that is not explained. In other words, an additional mediating variable(s) is indicated. Similar to this study's variable of "type of experience", George (1990) found that the affective tone of a group was a meaningful construct. Work groups in a retail setting with negative tone were negatively related to group engagement in prosocial acts, while groups with positive tone was negatively related to absenteeism.

Other research has indicated impact on groups by variables such as group formation, size, feedback, type of conflict, and group composition. While some of these

factors were used as controls in this study, further examination of the role of feedback, including instructor intervention, as well as group conflict is warranted.

This study was unable to control the type of task directly, and used a proxy measure defined by the number of group hours spent face-to-face instead. More tightly controlled classroom and lab assignments are needed to determine if the nature of the task explains the mixed impact of personal diversity on perceptions of group learning effectiveness.

Finally, the personal trait of race had negative impact despite the type of task used. Further study of the type of group conflict experienced and racial composition of the group is needed. In particular, it would be interesting to see if there is a particular race that tends to withdraw more than another. In addition, this study contains samples of all-black groups (Morgan State) that can be compared to groups where the member was a black and a racial minority.

Further Study for factors of perceptions of other's performance

A perceiver's tendency to refer to one attribution of a target person as an explanation for observed behavior is called overattribution bias (Yzerbyt, Rogier, & Fiske, 1998). While this study was testing to see what type of group tasks may mediate overattribution of member traits, it found instead that most variance in perception was due to the environment of the group situation (least or most positive experience). Although the empirical findings concerning the impact of particular traits on performance perception were clear, the impact of the overall environment (least or most positive experience) was also strong and significant. According to Kelley's (1967) attributional model, the presence of a behavioral consensus reduces attribution made

NOTE TO USERS

Page(s) not included in the original manuscript and are unavailable from the author or university. The manuscript was microfilmed as received.

188

This reproduction is the best copy available.

UMI

The managerial and academic press has produced many articles of research and anecdotal evidence touting the enhancement or inhibition of effectiveness when using groups. Corporate America has embraced diverse work groups by choice and by necessity. By choice, as managers attempt to improve productivity, product quality, and labor/management relations (Bettenhausen, 1991). By necessity, as work tasks become more technical and complex and as the labor force becomes more diverse.

In response, institutions of higher learning are using groups for learning to better model the real life situations their students will find themselves in when they graduate into the job market. Classroom concerns mirror those of managers – how to build teams, improve group performance, reduce conflict, and generate greater cohesion and commitment among group members. Instructors need practical guidelines to improve group work and students' group experience.

This study found that using an interdependent task (a task that promotes face-to-face interaction) for group work increases students' perceptions of group learning effectiveness. In particular, the study found that minority group members, who often experience greater problems in groups due to negative stereotypes, are more likely to perceive group learning effectiveness positively when using interactive tasks. Students in groups using interdependent tasks also perceived other members more positively than students in groups using independent tasks. Interdependent tasks seem to promote greater affect and positive attitudes for the work itself, and for other members.

The importance of student attitudes formed within the group (toward other members) and about group work will likely spill into attitudes they carry into their jobs. Interactive tasks lead to effective group work, which can be adopted as an important

method to give students the most positive opportunity to learn and practice group skills.

Using diverse groups and promoting positive attitudes can teach important and realistic skills for students' future in a diverse workforce.

Bibliography

Alagna, S.W. & Reddy, D. M. (1985) "Self and peer ratings and evaluations of group process in mixed-sex and male medical training groups", *Journal of Applied Social Psychology*, 15, 31-45.

Alexander, J. S., Lichtenstein, R., D'Aunno, T., McCormick, R., Muramatsu, N., & Ullman, E. (1997). "Determinants of mental health providers' expectations of patients' improvement", *Psychiatric Services*, vol. 48(5), pp. 671-677.

Ames, G. & Murray, F. (1982) "When two wrongs make a right: Promoting cognitive change by social conflict", *Development Psychology*, vol. 18, pp. 892-895.

Amabile, T. (1982) "Social Psychology of Creativity: A Consensual Assessment Technique," *Journal of Personality and Social Psychology*, vol. 43, pp. 997-1013.

Allport, G. (1954) The Nature of Prejudice. Cambridge, MA: Addison-Wesley.

Allport, G. H. (1953) The Individual and his religion. New York: MacMillan.

Ancona, D. G. & Caldwell, D. F. (1992) "Demography and Design: Predictors of new product team performance", *Organization Science*, vol. 3, pp. 321-341.

Aronson, E., Stephan, C., Sikes, J., Blaney, N., & Snapp, M. (1978) The Jigsaw Classroom, Beverly Hills, Calif.: Sage Publications

Ashmore, R. (1970) "Solving the Problem of Prejudice", In B. Collins (Ed.), Social psychology: Social influence, attitude change, groups processes, and prejudice. Reading, Mass.: Addison-Wesley.

Banas, P.A. (1988) "Employee involvement: A sustained labor/management initiative at the Ford Motor Company", In J.P. Campbell and R.J. Campbell (Eds.), *Productivity in Organizations: New perspectives from industrial and organizational psychology*. (pp. 388-416) San Francisco, CA: Jossey-Bass.

Bantel, K. A. and Jackson S. E. (1989) "Top management and innovations in banking: Does the composition of the top team make a difference?" *Strategic Management Journal*, vol. 10: pp. 107-124.

Belsley, D.A., Kuh, E., and Welsch, R.E. (1980) Regression Diagnostics, New York: John Wiley & Sons, Inc.

Berkowitz, L. & Daniels, L. (1963) "Responsibility and Dependency", Journal of Abnormal and Social Psychology, vol. 31, pp. 1020-1030.

Bettenhausen, K.L. (1991) "Five years of group research: What have we learned and what needs to be addressed." *Journal of Management*, No. 17 vol. 2, pp. 345-381.

Boyatzis, R., Cowen, S., & Kolb, D. (1991) "Reflections on curriculum innovation in higher education: The new Weatherford MBA program", In R. Sims & S. Sims (Eds.), Managing institutions of higher education in the 21st century, from the series Contributions to the Study of Education, No. 48 Greenwood Press. Westport, Conn.

Boyatzis, Richard (1994) "Stimulating self-directed learning through the managerial assessment and development course", *Journal of Management Education*, vol. 18, no. 3, pp. 304-323.

Champoux, J.E. (1996) Organizational Behavior: integrating individuals, groups and processes, West Publishing Co: St. Paul, MN p. 77.

Chideya, Farai (1999) "The Color of our Future", as cited in *Time*, February 1, 1999, p. 54.

Cooper, L., Johnson, D. W., Johnson, R., & Wilderson, F. (1980) "Effects of Cooperative, competitive, and individualistic experiences on interpersonal attraction among heterogeneous peers" *Journal of Social Psychology*, vol. 111, pp. 243-252.

Cox, T. (1993) Cultural Diversity in Organizations, San Francisco: Berrett-Koehler.

Cox, T. H., Lobel, S.A., & McLeod, P.L. (1991) "Effects of Ethnic Group Cultural Differences on Cooperative and Competitive Behavior On A Group Task". *Academy of Management Journal*, vol. 34, no. 4, pp. 827-847.

Cross T. & Slater, R. B. (1998) "The impact of a rollback of affirmative action on the nation's major MBA programs", *Business and Society Review*, vol. 100/101, pp. 81-84.

Cummings, L., Zhour, J. & Oldham, G. (1993) "Demographic differences and employee work outcomes: Effects of multiple comparison groups" Paper presented at the Annual Meeting of the Academy of Management, Atlanta, GA.

Dalton, D. R., Rau, J. & Metzger, M. B. (1998) "Hopwood is Bad Business for Business Schools", *Business and Society Review*, vol. 100/101, pp. 41.

Deming, Edward (1986) Out of the Crisis, Cambridge, MA: MIT Press

Deutsch, M. (1962) "Cooperation and Trust: Some theoretical notes", In M.R. Jones (ed.), *Nebraska symposium on motivation*, Lincoln: University of Nebraska Press.

Devries, D. & Edwards, K. (1974) "Cooperation in the classroom: Towards a theory of alternative reward-task classroom structures", Paper presented at the annual meeting of the American Educational Research Association, Chicago, April 1974.

Devries, D, Edwards, K., & Slavin, R. (1978) "Biracial learning teams and race relations in the classroom: Four field experiments on teams-games-tournament", *Journal of Educational Psychology*, vol. 70, pp. 356-362.

DeVries, D. Edwards, K. & Wells, E. (1974) "Team competition effects on classroom group process", Report no. 174, Center for Social Organization of Schools, The Johns Hopkins University, Baltimore, MD.

DeVries, D., & Slavin, R., (1978) "Team-Games-Tournaments: A research review", *Journal of Research and Development in Education*, vol. 12, pp. 28-38.

Dick, G.N. (2001) "The Suitability of Tasks for Telecommuting: Development of a Theoretical Model", *Proceedings of the 4th Annual Conference of the Southern Association for Information Systems*, pp. 183-199.

Dumaine, B. (1990, May 7.) "Who needs a Boss?" *Fortune*, pp. 52-60.

Feichtner, S. B. & Davis, E. A. (1985) "Why some groups fail: A survey of student's experiences with learning groups", *The Organizational Behavior Teaching Review*, vol. 9, #4, pp. 58-73.

Fenelon, J. R. and Megargee, E. I. (1971) "Influence of race on the manifestation of leadership", *Journal of Applied Psychology*, vol. 55, pp. 325-358.

Fields, D.L & Blum, T.C. (1997). "Employee satisfaction in work groups with different gender composition" *Journal of Organizational Behavior*, vol. 18(2), pp. 181-196.

Filley, A. House, R. & Kerr, S. (1976) Managerial process and Organizational Behavior, Glenview, IL: Scott Foresman

Fomby, Thomas B., Hill, R. Carter, and Johnson, Stanley R. (1984) Advanced Econometric Methods, New York: Springe-Verlag

Franks, Gus (1998) Conversation with Assistant to the Director of Minority Student Recruitment Services, April 1, 1998.

Gandara, Patricia (1995) "When the glass is half full", *NEA Today*, Dec. 1995, vol. 14, no. 5, p 16.

George, Jennifer (1990) "Personality, Affect, and Behavior in Groups", *Journal of Applied Psychology*, vol. 75, no. 2, p. 108.

Gerard H., Jackson, T., & Connolley, E. (1975) "Social contact in the desegregated classroom". In H. Gerard and N. Miller (Eds.), School desegregation. New York: Plenum.

Glick, W.H., Miller, C.C., and Huber, G. (1993), "The Impact of upper-Echelon Diversity on Organizational Performance", in G. P. Huber and W.H. Glick (Eds.), *Organizational Change and Redesign*, New York: Oxford University Press, pp. 176-214.

Griffiths, William E., Hill, Carter & Judge, George G. (1993) Learning and Practicing Econometrics, page 486, USA: John Wiley and Sons

Gully, S., Devine, D., and Whitney, D. (1995) "A Meta-analysis of Cohesion and Performance: Effects of level of analysis and task interdependence", *Small Group Research*, vol. 26 #4, pp. 497-520.

Hackman, J. R. (1969) "Toward Understanding the Role of Tasks in Behavioral Research", *Acta Psychologica*, vol. 31, pp. 97-128.

Hackman, J.R. & Oldham, G. R. (1980) Work Redesign. Reading, MA: Addison-Wesley.

Hambrick, D. C. & Mason, P. (1984), "Upper Echelons: The Organization as a Reflection of its Top Managers", *Academy of Management Review*, vol. 9, pp. 193-206.

Hambrick, D. C., Davison, S. C., Snell, S. A., & Snow, C.C. (1998) "When Groups Consist of Multiple Nationalities: Towards a New Understanding of the Implications", *Organization Studies*, vol. 19, no. 2, pp. 181-205.

Harrison, D. A., Price, K. H. & Bell, M. (1998) "Beyond Relational Demography: Time and Effects of Surface- and Deep-Level Diversity on Work Group Cohesion", *Academy of Management Journal*, vol. 41, no. 1, pp. 96-107.

Hawkins, Katherine & Power, Christopher (1999). "Gender Differences in Questions asked during Small Decision-Making Group Discussion" *Small Group Research*, vol. 30, no. 2, pp. 235-256.

Heider, Fritz. (1946). "Attitudes and cognitive organization." *Journal of Psychology*, vol. 21, pp. 107-112.

Hoerr, J. (1989) "The payoff from teamwork." *Business Week*, July 10, 1989, pp. 56-62.

Horvath, L. and Tobin, T.J. (1999) "Twenty-First Century Teamwork: Defining Competencies for Virtual Teams." Paper presented at the 1999 Academy of Management Meeting, Chicago, IL.

Jackson, S. E., May, K. E., and Whitney, K. (1995). "Dynamics of diversity in decision making teams", In Guzzo, R. A., & Salas, E. (Eds.), Team Effectiveness and Decision Making in Organizations. San Francisco: Jossey-Bass.

Jackson, S. E., Stone, V. K., and Alvarez, E. B. (1993) "Socialization Amidst Diversity: The Impact of Demographics on Work Team Old-timers and Newcomers", *Research in Organizational Behavior*, vol. 15, pp. 45-109.

Jackson, Brett, J. F., Sessa, V. I., Cooper, D. M., Julin, J. A., & Peyronnin, K. (1991) "Some differences make a difference: Individual dissimilarity and group heterogeneity as correlates of recruitment, promotions, and turnover", *Journal of Applied Psychology*, vol. 76, pp. 675-689.

Johnson, D. W. & Johnson, R. T. (1975) Learning Together and Alone: Cooperation, competition, and individualization. Englewood Cliffs, NJ: Prentice-Hall

Johnson, D. W. & Johnson, R. T. (1980) "Integrating Handicapped students into the mainstream", *Exceptional Children*, vol. 46, pp. 89-98.

Johnson, D. W. & Johnson, R. T. (1981) "Effects of cooperative and individualistic learning experiences on interethnic interaction", *Journal of Educational Psychology*, vol. 73, pp. 444-449.

Johnson, D. W. & Johnson, R. T. (1982) "Effects of cooperative and individualistic learning experiences on cross-ethnic interaction and friendships", *Journal of Social Psychology*, vol. 118, pp. 47-58.

Johnson, D. W., Johnson, R. T., & Maruyama, G. (1983) "Interdependence and Interpersonal Attraction Among Heterogeneous and Homogeneous Individuals: A theoretical Formulation and a Meta-analysis of the Research" *Review of Educational Research*, vo. 53, no. 1, pp. 5-54.

Johnson, D. W. & Johnson, R. T. (1989) Cooperation and Competition: theory and research. Minneapolis, MN Interaction Book Company.

Johnson, D. W. & Johnson, R. T. (1994) Joining Together: Group Theory and group skills, Boston: Allyn and Bacon

Johnson, D. W., Johnson, R. T., Johnson, J., & Anderson, D. (1976) "Effects of cooperative versus individualized instruction on student prosocial behavior, attitudes toward learning and achievement" *Journal of Educational Psychology*, vol. 68, no. 4, pp. 446-452.

Johnson, D.W., Johnson R. T., & Scott L, (1978) "The effects of cooperation and individualized instruction on student attitudes and achievement", *The Journal of Social Psychology*, vol. 104, pp. 207-216.

Johnson, D.W., Johnson, R. T., & Smith, K.A. (1998) "Cooperative Learning Returns to College", *Change*, July-August 1998, vol. 30, pp. 26-36.

Johnson, D.W., Johnson, R. T., & Smith, K.A. (1991) Cooperative Learning: increasing college faculty instructional productivity, Washington, D.C.: George Washington University Press

Johnson, Judith L. (1997) "Commuter college students: What factors determine who will persist and who will drop out?" *College Student Journal*, Vol. 3, #3, pp. 323-332.

Johnston W. B. & Packer, A. H. (1987) Workforce 2000, Indianapolis, IN: Hudson Institute

Judy, Richard W. & D'Amico, Carol. (1997) Workforce 2020, Indianapolis, IN: Hudson Institute

Kanter, R. M. (1988) "When a thousand flowers bloom: Structural, collective, and social conditions for innovation in organization" In B.M. Staw and L.L.Cummings (Eds.), *Research in organizational behavior* (Vol. 10, pp. 169-211) Greenwich, CT: JAI Press

Kanter, R. M. (1989) When giants learn to dance. New York: Simon & Schuster

Kelley, Harold H. (1967) "Attribution theory in social psychology" In D Levine (ed.) *Nebraska symposium on motivation* (vol. 15, pp. 192-238). Lincoln: University of Nebraska Press.

Kelley, Harold H. (1973) "The Process of Causal Attribution", *American Psychologist*, February, 107-128.

Kerlinger, Fred (1986) Foundations of Behavioral Research, 3rd. ed., Holt, Rinehard and Winston, Inc.: Ft. Worth.

Kirchmeyer, Catherine (1993) "Multicultural Task Groups: An account of the low contribution level of minorities", *Small Group Research*, vol. 24, #1, pp. 127-148.

Korn, H.J., Milliken, F. J. & Lant, T. K. (1992) "Top management team change and organizational performance: The influence of succession, composition, and context". Paper presented at the annual meeting of the Academy of Management, Las Vegas, NV.

Kurfiss, J. G. (1988) Critical Thinking: Theory, research, practice, and possibilities, Washington, D.C. The George Washington University, School of Education and Human Development.

Lawrence, Barbara (1987) "An Organizational Theory of Age Effects", in S. Bacharach and N. DiTomaso (Eds.) *Research in the Sociology of Organizations*, 5, Greenwich, CT: JAI Press, 37-71.

Lawrence, Barbara S. (1997) "The Black Box of Organizational Demography", *Organization Science*, vol. 8, no. 1, pp. 1-22.

Lazarowitz R., Sjaram. S. & Steinberg, R., (1980) "Classroom learning style and cooperative behavior of elementary school children", *Journal of Educational Psychology*, vol. 72, pp. 97-104.

Li, J., Karakowsky L., and Siegel, J. (1999) "The Effects of Proportional Representation on Intragroup Behavior in Mixed-Race Decision-Making Groups", *Small Group Research*, vol. 30, no. 3, pp. 259-279.

Luthans, Fred (1995) Organizational Behavior (7th ed.) New York: McGraw-Hill

Maxwell, Scott E. and Delaney, Harold D. (1989) Designing Experiments and Analyzing Data: A model comparison perspective, Belmont, California: Wadsworth Publishing Co.

McLeod, P.L, Lobel, S.A. & Cox, T.H. (1996) "Ethnic Diversity and Creativity in Small Groups" *Small Group Research*, vol. 27, no. 2, pp. 248-264.

Michaelsen, L. (1999-2000) Interviews in 1999 and 2000.

Michaelsen, L., Fink, L.D., and Knight, A. (1997) "Designing Effective Group Activities: Lessons for Classroom Teaching and Faculty Development", *To Improve the Academy*, July 7, 1997

Michaelsen, L., Watson, W., & Black, R. (1989) "A Realistic Test of Individual Versus Group Consensus Decision Making", *Journal of Applied Psychology*, vol. 74, #5, pp. 834-839.

Milliken, F.J. & Martins, L.L. (1996) "Searching for common threads: understanding the multiple effects of diversity in organizational groups", *Academy of Management Review*, vol. 21 (2) pp. 402-432.

Mullen, B. & Riordan, C. A. (1988) "Self-Serving Attributions for Performance in Naturalistic Settings", *Journal of Applied Social Psychology*, vol. 18, pp. 3-22.

Myers, David G. (1990) *Social Psychology*, 2nd ed., McGraw-Hill, New York, p. 71.

O'Reilly, Charles A., Caldwell, David F., & Barnett, William P. (1989) "Work group demography, social integration and turnover." *Administrative Science Quarterly*, vol. 34, pp. 21-37.

Pelled, L. (1996) "Demographic Diversity, conflict, and work group outcomes: An intervening process theory", *Organization Science*, vol. 7., pp. 615-631.

Pfeffer, J. (1983) "Organizational Demography" in L.L. Cummings and B. Staw (eds.), *Research in Organizational Behavior*, vol. 5, Greenwich, CT: JAI Press, pp. 299-357.

Porter, L. & McKibben, L. (1988) Management education and development: Drift or thrust into the 21st century? New York: McGraw-Hill

Reisberg, Leo (1998) "In Bids to Increase Minority Enrollments, Colleges Deal with Reality and Perceptions", *The Chronicle of Higher Education*, April 2, 1999, pg. A49.

Rich, Wilbur (1998) "Spontaneous Talk, Linguistic Capital, and Diversity: Communication in Knowledge-based organizations", *Administration and Society*, vol. 30, #3, pp. 315-329.

Rogelberg, S. G., & Rumery, S. (1996). "Gender diversity, team decision quality, time-on-task, and interpersonal cohesion." *Small Group Research*, vol. 27, pp. 79-90.

Riordan, C. & Shore (1997) "Demographic Diversity and Employee Attitudes: An Empirical Examination of Relational Demography Within Work Units" *Journal of Applied Psychology*, vol. 82, no. 3, pp. 342 -359.

Rotter, J. B., Liverant, S., & Crowne, D. (1961) "The Growth and Extinction of Expectancies in Chance-Controlled and Skilled Tasks", *The Journal of Psychology*, July, pp. 161-177.

Ruhe, J.A. and Allen, W. R. (1977) "Differences and similarities between black and white leaders", *Proceedings of the American Institute of Decision Sciences, Northeast Division*, pp. 30-35.

SAS Institute, Inc. (1994) SAS/STAT User's Guide, Version 6, Fourth Edition. Cary, North Carolina: SAS Institute Inc.

Saunders, Carol Stoak (2000) "Virtual Teams: Piecing Together the Puzzle" In Robert W. Zmud (Ed.) *Framing the Domains of IT Management: Projecting the Future Through the Past*: pg. 29-50. Cincinnati, Ohio: Pinnaflex Education Resources, Inc.

Sessa, V. I. & Jackson, S. E. (1995) "Diversity in decision-making teams: All differences are not created equal." In M.M. Chemers, S. Oskamp, & M. A. Costanzo

(Eds.), *Diversity in organizations: New perspectives for a changing workplace*: 133-156. Thousand Oaks, CA: Sage.

Sharan, Shlomo (1980) "Cooperative Learning in Small Groups: Recent Methods and Effects on Achievement, Attitudes, and Ethnic Relations", *Review of Educational Research*, vol. 50, pp. 241-271.

Shaw, Marvin (1973) "Changes in Sociometric Choices Following Forced Integration of an Elementary School" *Journal of Social Issues*, vol. 29, pp. 143-159.

Shaw, Marvin, (1981) Group Dynamics: The psychology of small group behaviors 3rd Ed. New York: McGraw Hill.

Simons, T. (1995) Top Management Team Consensus, heterogeneity, and debate as contingent predictors of company performance: the complementarity of group structure and process. *Academy of Management Best Papers Proceedings*: pp. 62-66.

Slavin, R. (1978) "Student teams and comparison among equals: Effects on academic performance and student attitudes", *Journal of Educational Psychology*, vol. 70, pp. 532-538.

Slovic, P., & Lichtenstein, S. (1971), "Comparison of Bayesian and regression approaches to the study of information processing in judgment", *Organizational Behavior and Human Performance*, vol. 1, pp. 3-30.

St. John, N. (1975) School Desegregation, New York: John Wiley.

Stephan, W. (1985) "Intergroup Relations", In G. Lindzey & E. Aronson (eds.), Handbook of social psychology (pp. 599-658) New York: Random House

Thompson, J.D. (1967) Organizations in Action: Social Science Bases of Administrative Theory, New York: McGraw Hill

Tjosvold, D., Johnson, D. W., & Johnson, R. (1981) "Effect of partner's effort and ability on liking for partner after failure on a cooperative task", *The Journal of Psychology*, vol. 109, pp. 147-152.

Tobias, S. (1990) "They're not dumb. They're different: A new "tier of talent" for science", *Change*, vol. 22, pp. 11-30.

Towers Perrin (1991) Priorities for Competitive Advantage

Tsui, A., Egan, T., & O'Reilly, C. (1992) "Being Different: Relational demography and organizational attachment", *Administrative Science Quarterly*, vol. 37, pp. 549-579.

Tsui, A., & O'Reilly, C. (1989) "Beyond simple demographic effects: The importance of relational demography in superior-subordinate dyads", *Academy of Management Journal*, vol. 32, pp. 402-423.

Turner, J. (1987) Rediscovering the social group: A social categorization theory, Oxford, UK: B. Blackwell

Verkuyten, M. De Jong, W., & Masson C.N. 1993 "Job satisfaction among ethnic minorities in the Netherlands" *Applied Psychology: An international review* vol. 421 pp. 171-189.

Wagner, W. G., Pfeffer, J. & O'Reilly, C. A. (1984) "Organizational Demography and Turnover in top management groups", *Administrative Science Quarterly*, vol. 29, pp. 74-92.

Watson, W.E., Johnson, L. & Merritt, D. (1998) "Team Orientation, Self-Orientation and Diversity in Task Groups: Their connection to team performance over time" *Group & Organization Management*, vol. 23, no. 2, pp. 161-188.

Watson, W. E., Kumar, K. and Michaelsen, L. K. (1993) "Cultural diversity's impact on interaction process and performance: Comparing homogenous and diverse task groups", *Academy of Management Journal*, vol. 36, pp. 590-602.

Weigel, R., Wiser, P. & Cook, S. (1975) "The impact of cooperative learning experiences on cross ethnic relations and attitudes", *Journal of Social Issues*, vol. 31, pp. 219-245.

Whetten D., Windes D., May, D. & Bookstaver, D. (1991) "Bringing management skill education into the mainstream", In J. Bigelow (Ed.) Managerial Skills. Newbury Park, CA: Sage.

Wiersema, M. F., & Bantel, K.A. (1992) "Top management team demography and corporate strategic change", *Strategic Management Journal*, vol. 14, pp. 485-504.

Williams, Katherine & O'Reilly, Charles III. (1998) "Demography and Diversity In Organizations: A Review of 40 Years of Research", *Research in Organizational Behavior*, vol. 20, pp. 77-140.

Wilson, W. R. (1982) The use of permanent learning groups in teaching introductory accounting, Unpublished Doctoral Dissertation, The University of Oklahoma.

Wojtkowski, W. & Wojtkowski, W. G. (1987) "Utilizing group learning in computer information classes", *Journal of Education for Business*, vol. 62, pp. 347-352.

Wood W., Polek, D. & Aiken, C. (1985) "Sex differences in group task performance", *Journal of Personality and Social Psychology*, vol. 48, pp. 63-71.

Wood, R. E. (1986) "Task complexity: Definition of the construct", *Organizational Behavior and Human Decision Processes*, vol. 37, pp. 60-82.

Yzerbyt, Vincent Y., Rogier, Anouk and Fiske, Susan T. (1998) "Group Entitativity and Social Attribution: on translating situational constraints into stereotypes", *Personality and Social Psychology Bulletin*, vol. 24 No. 10, pp. 1089-1103.

Zalkind, Sheldon and Costello, Timothy (1962) "Perception: Some recent research and Implications for Administration" *Administrative Science Quarterly*, September 1962, pp. 227-229.

Zenger, Todd R. and Lawrence, Barbara S. (1989) "Organizational Demography: The differential effects of age and tenure distributions on technical communication" *Academy of Management Journal*, vol. 32, no. 2, pp. 353-376.

Other Readings:

Ammeter, Anthony P. and Gilson, Lucy L. (1998) "Trust and Demography in Project Groups", *Proceedings of the Southern Management Association*, Barr, ed. 1998.

Anderson, C. R. & Schneier, C. E. (1978) "Locus of Control, Leader Behavior and Leader Performance Among Management Students", *Academy of Management Journal*, December 1978, pp. 690-698.

Baker, Diane Fay (1997) The Formation of Collective Efficacy and its Relationship to Self Efficacy, Goals, Effort and Group Performance: A Longitudinal Perspective. Unpublished Doctoral Dissertation, University of Oklahoma.

Blaine, B.E., Trivedi, P. & Eshleman, A. (1998) "Religious Belief and the Self-concept: Evaluating the Implications for Psychological Adjustment", *Personality and Social Psychology Bulletin*, vol. 24, no. 10, pp. 1040-1052.

Blau, Gary (1993) "Testing the Relationships of Locus of Control to Different Performance Dimensions", *Journal of Occupational and Organizational Psychology*, June, pp. 125-138.

Blumer, H. (1958). "Race prejudice as a sense of group position", *Pacific Sociological Review*, 1: pp. 3-7.

Bowditch, J. L. & Buono, A. F. (1994) A Primer on Organizational Behavior, 3rd ed., Wiley: New York, p. 72.

Campbell, D. & Fiske, D (1959) "Convergent and Discriminant Validation by the Multitrait-Multimethod Matrix," *Psychological Bulletin*, vol. 54, pp. 81-105.

Cartwright, Dorwin and Zander, Alvin (eds.) (1968), Group Dynamics: Research and Theory, (3rd ed.) New York: Harper and Row

Ely, R. J. (1994) "The Effects of Organizational Demographics and Social Identity on Relationships Among Professional Women" *Administrative Science Quarterly*, vol. 34, pp. 203-238.

Fambrough, Mary J. & Comerford, Susan Ann (1998) "Changing Epistemological Assumptions of Group Theory", Paper presented at Academy of Management meeting, unpublished.

Gaertner, S. L., Mann, J., Murrell, A, and Dovidio, J. F. (1989) "Reducing intergroup bias: The benefits for recategorization", *Journal of Personality and Social Psychology*, vol. 57, pp. 239-249.

Garcia, Joseph (1994) "Reflections on teaching diversity", *Journal of Management Education*, vol. 18, no. 4, pp. 428-431.

Gersick, C.J.G. (1988) "Time and Transition in work teams: Toward a new model of group development", *Academy of Management Journal*, vol. 31, pp. 9-41.

Glogow, Eli (1986) "Research Note: Burnout and Locus of Control", *Public Personnel Management*, Spring, p. 79.

Gordon, R. A. & Howell, J.E. (1959) Higher education for business, New York: Columbia University Press.

Hewstone, M. (1989) Causal Attribution: From cognitive processes to collective beliefs. Cambridge: Basil Blackwell.

Isenberg, D. J. (1981) "Some effects of time pressure on vertical structure and decision making accuracy in small groups", *Organizational Behavior and Human Performance*, vol. 27, pp. 119-134.

Jones, Colleen (1994) "A contribution or a commitment? Personal insights on diversity appreciation in the classroom", *Journal of Management Education*, vol. 18, no. 4, pp. 432-437.

Kanter, R. (1977) "Some effects of proportions on group life: Skewed sex ratios and responses to token women", *American Journal of Sociology*, vol. 82., Pp. 965-990.

Kelly, J. A., Wildman, H. E., & Urey, J. R. (1982) "Gender and sex role differences in group decision-making social interactions: A behavioral analysis", *Journal of Applied Social Psychology*, vol. 12, pp. 112-127.

Kelly, J. R. & Karau, S. J. (1993) "Entrainment of creativity in small groups", *Small Group Research*, vol. 24, pp. 179-198.

Kerr, N.L. (1983) "Motivation Losses in Small Groups: A social dilemma analysis" *Journal of Personality and Social Psychology*, vol. 45, pp. 819-828.

Kolb D.A., (1984) Experiential Learning: Experience as the source of learning and development, Englewood Cliffs, NJ: Prentice-Hall

Kravitz, D.A. & Martin, B. (1986) "Ringelmann rediscovered: The original article", *Journal of Personality and Social Psychology*, vol. 50, pp. 936-941.

Kreitner, Robert & Kinicki, Angelo, (1992) Organizational Behavior, 2nd Ed., Irwin: Homewood, IL., p. 148.

Latane, B., Williams, K. & Harkins, S. (1979) "Many hands make light the work: The causes and consequences of social loafing", *Journal of Personality and Social Psychology*, vol. 37, pp. 822-832. As cited in Michaelson, L., Fink, L.D., and Knight, A. (1997) "Designing Effective Group Activities: Lessons for Classroom Teaching and Faculty Development", *To Improve the Academy*, July 7, 1997

Lau, Dora C and Murnighan, Keith (1998) "Demographic diversity and faultlines: the compositional dynamics of organizational groups", *Academy of Management Review*, vol. 23, no. 2, pp. 325-341.

Lim, S.G. and Murnighan, J.K. (1994) "Phases, deadlines, and the bargaining process", *Organizational Behavior and Human Decision Processes*, vol. 58, pp. 153-171.

McGrath, J. E., and Altman, I. (1966) Small Group Research: A synthesis and critique of the field. New York: Holt

McGrath, J. E., and Kelly, J. R (1985) "Effects of time limits and task types on task performance and interaction of four-person groups", *Journal of Personality and Social Psychology*, Vol. 49, pp. 395-407.

McGrath, J.E., and Kelly, J. R. (1986) Time and human interaction: Toward a social psychology of time. New York, Guilford Press

McLeod, P.L. and Lobel, S.A. (1992) "The effects of ethnic diversity on idea generation in small groups", *1992 Proceedings of the Academy of Management*, pp. 227-231.

McMillen, M. C., White, J., & McKee, A. (1994) "Assessing managerial skills in a social context", *Journal of Management Education*, Vol. 18, #2, pp. 162-181.

Miller, D., DeVries, M. & Toulouse, J. (1982) "Top Executive Locus of Control and Its Relationship to Strategy-Making, Structure, and Environment", *Academy of Management Journal*, June, pp. 237-253.

Miller, Peter (1992) "The Tavistock Mission: A Review Essay", *Human Relations*, vol. 45 (4), pp. 411-426

Minority Student Recruiting Services (1998), "Hallmark of Black Achievement II: the University of Oklahoma All-Class Reunion"

Orbell, J. & Daws, R. (1981) "Social Dilemmas", In G. Stephenson & J.H. Davis (Eds.) Progress in applied social psychology, 1 ed.: Chichester, England: Wiley

Owens, P., Rammell, B., Roberts, D., (1998) "It ain't Harv'ard, mum", *The Guardian*, June 2, 1998, pGHII(2).

Payette, Adrien (1993) "To Teach Experience", *Management Education*, vol. 17, no. 4, pp. 44-453.

Pierson, F. C. (1959) The Education of American Businessmen, New York: McGraw Hill Book Co.

Piore, M.J. and Sable, C.F. (1984). The second industrial divide: Possibilities for prosperity. New York: Basic Books. As cited in Jackson, S. E., Stone, V. K., & Alvarez, E. B. (1993) "Socialization Amidst Diversity: The impact of demographics on work team oldtimers and newcomers", *Research in Organizational Behavior*, vol. 15, pp. 45-109.

Pryor, M. W. & Distenano, M. K. (1971) "Perceptions of Leadership, Job Satisfaction, and Internal-External Control Across Three Nursing Levels", *Nursing Research*, November-December, pp. 534-537.

Seers, A. & Woodruff, S. (1997) "Group development or deadline pressure?" *Journal of Management*, vol. 23, pp. 169-188.

Schnake, Mel (1991) "Equity in Effort: The "Sucker Effect" in Co-Acting Groups", *Journal of Management*, vol. 17, no. 1, pp. 41-55.

Smith, K., Johnson, D.W., Johnson, R. (1981) "Can Conflict Be Constructive? Controversy Versus Concurrence Seeking in Learning Groups", *Journal of Educational Psychology*, Vol. 73, pp. 651-663.

Spector, Paul E. (1982) "Behavior in Organizations as a Function of Employees' Locus of Control", *Psychological Bulletin*, May, pp. 482-497.

Straus, Susan (1999) "Testing a Typology of Tasks: An empirical Validation of McGrath's (1984) Group Task Circumplex", *Small Group Research*, vol. 30, no. 2, pp. 166-187.

Taifel, H. (1982) Social Identity and intergroup relations. Cambridge: Cambridge University Press

Thomas, David & Ely, Robin (1996) "Making Differences Matter: A new paradigm for managing diversity", *Harvard Business Review*, September-October, pp. 79-90.

Van Buren III, Harry J. (1998) "Ending the culture of corporate discrimination" *Business and Society Review*, vol. 100/101, pp. 20-23.

Waller, M. J., Zellmer, M.E. & Giamgatista, R.C. (1997) "The effects of shifting deadlines on attention to time in groups", Paper presented at the annual meeting of the Academy of Management, Boston.

Weiner, Bernard (1972) Theories of Motivation, Chap. 5, Rand McNally: Chicago.

Weiner, Bernard (1985) "An Attribution Theory of Achievement Motivation and Emotion", *Psychological Review*, October 1985, pp. 548-573.

Whitely, William (1998) Interview on April 9, 1998.

Wood, R. & Bandura, A. (1989) "Social Cognitive theory of organizational management", *Academy of Management Review*, vol. 14, pp. 361-384.

Appendix A: Instruments

Surveys

Appendix A.1a “Most Positive Experience, Front”

Appendix A.1b “Least Positive Experience, Front”

Appendix A.1c “Both Survey Instruments, Back”

Survey Questions with Variable Names

- A. What was the course title of the class in which you had the least (or most) positive experience with learning groups.

Survey question to help respondent focus in on one condition, one class, one group.

1. What class standing were you at the time? (Please fill just one letter on the NCS form)

A) Freshman B) Sophomore C) Junior D) Senior

Percept/Percept check for similar answer in matrix

2. Were you in more than one group in this class? A. YES B. NO
(saliency)

- B. Why did you choose the group in this class as the least or most positive group experience rather than a group in other classes?

This open ended question is designed to capture other intervening variables not tested in the pretrial survey.

We would like to know about some specific aspects of the way in which the groups were used in the class you listed above.

3. How long did you work in this group? (IE: How many weeks of the semester elapsed between the time the groups were formed and the completion of their last assignment)?

A. 1-2 weeks C. 5-8 weeks
B. 3-4 weeks D. 8-12 weeks E. 12-16 weeks (whole semester)
(Control: Group Tenure)

4. How were groups formed?

A. student's choice C. combination of 1 & 2 (Group Formation)

B. instructor's choice D. random instructor's choice

5. Are you on a quarter or semester system? A = Quarter B = Semester (Control: Group Tenure))

6. How many credit hours was this class worth?

A. 1 hour B. 2 hours C. 3 Hours D. 4 Hours E. Over 4 Hours
(Saliency)

- C. How many hours in class did you spend working as a group over the entire semester ? ____ Hrs. (Frequency)

D. What was the total number of hours you spent on group projects or assignments outside of class for the semester? _____ Hrs.
(Saliency)

E. Of the time spent on group projects or assignments, how many hours did you spend in a face-to-face group setting? _____
(Nature of Task: Interdependent (E/F), Frequency)

F. Of the time spent on group projects or assignments, how many hours did you spend working alone? _____
(Nature of Task: Independent (E/F), Saliency)

7. How many members were in your group?
A. 3 C. 5 E. 7 (control: Group size)
B. 4 D. 6

Please tell us how many of each type of graded assignment(s) your group was required to complete.

G. How many class presentations? _____
H. How many group exams? _____
I. How many research projects? _____
J. How many written papers? _____
K. How many case studies? _____
L. How many other tasks? _____
M. Please describe task _____
N. Total # of group assignments: _____
(Nature of the task)

What percentage of the final course grade (if any) was determined by:

O. _____ % Group Work
P. _____ % Individual Work
Q. _____ % Peer Evaluation
R. _____ % Subjective evaluation of the instructor (such as class participation, etc.)
S. _____ % Other --Please describe what kind of work it was _____
T. Total = 100 % (Saliency)

8. *On a scale of 1 (complete waste of time) to 5 (extremely valuable learning experience), what is your overall assessment of the group work in the class?*
(Perception of Learning Effectiveness)

For questions 9-34, please use this five-point scale in your response. Please mark response on NCS form.

1	2	3	4	5
Not At all	Occas- ionally	Half the Time	More Often Than Not	Totally

To what extent were tasks in this class

9. Divided into individual tasks early on, and primarily completed by individuals?
(Nature of Task: Independent)

10. Prepared for by individuals in advance, and the primary group task was to choose or decide? (Nature of Task: Interdependent)

To what extent was your group study a result of group work? To what extent was study a result of individual work?

11. Group work (Nature of Task: Interdependent)

12. Individual work (Nature of Task: Independent)

To what extent do you believe peer evaluations (if applicable) were affected by:

13. Personality

14. Participation

15. Contribution

16. Effort

17. Other (describe)

(Saliency)

To what extent did you receive or experience:

18. ongoing feedback on group performance

19. competition between groups

20. Assistance from outside the group: help for group conflicts, etc.

21. Monitoring of group behaviors

22. Other (please list anything else that you think makes a difference in group work)
(Feedback)

Evaluate this group experience in terms of overall effectiveness.

23. To what extent did this experience enhance the learning of class material?

24. To what extent did this experience enhance your overall collegiate education?
(Perception of Learning Effectiveness)

According to assignment type, to what extent was conflict present in the group while trying to complete the assignment?

25. Class presentation

26. Group Exam

27. Written Report

28. Research Project

29. Class Discussion

30. Other (describe) _____

(Conflict, Nature of Task Percept/Percept check)

To what extent was feedback from the instructor

31. Ongoing

32. At end of class term

33. Absent

34. Periodic (Describe how often)

(Feedback)

U. Overall, what do you feel is the most positive aspect of your experience with small groups in the classroom?

(Learning Experience) This open ended question is designed to capture other intervening variables not tested in the pretrial survey.

V. Overall, what do you feel is the most negative aspect of your experience with small groups in the classroom?

(Learning Experience) This open ended question is designed to capture other intervening variables not tested in the pretrial survey.

Using the matrix and codes below, please describe the members of your group, including yourself. For each category box, fill in corresponding circle to the code provided on the NCS form to describe that person to the best of your knowledge. IE: If you are female, mark "B" on the NCS form for Gender/Yourself #35. To help you keep track, you may want to write in the first names of members you are describing on the matrix itself. If you do not have enough group members to fill out all the boxes, skip those numbers.

CODES FOR USE IN MATRIX: T

This matrix reports all personal trait independent variables, Control: composite measure of group heterogeneity

Percept/Percept check on group size, respondent's class standing

VARIABLES OF :GENDER, AGE, RACE, ETHNICITY, ENGLISH Fluency, MAJOR, CLASS Standing

Person being described	First Name (Optional)	Gender	Age	Race	Nationality	English Fluency	Major	Class Standing
Yourself #1		35	36	37	38	39	40	41
Member #2		42	43	44	45	46	47	48
Member #3		49	50	51	52	53	54	55
Member #4		56	57	58	59	60	61	62
Member #5		63	64	65	66	67	68	69
Member #6		70	71	72	73	74	75	76
Member #7		77	78	79	81	81	82	83
Member #8		84	85	86	87	88	89	90

Please put the # of the group member that best describes each of the following statements. Task/Behavior Traits

Best Communication/Writing skills? ____ (BC)____ **Worst**
Communication/Writing skills? _ (WC)_____

Most knowledge of the subject? ____ (MK)____ **Least** knowledge of the
subject? _ (LK)_____

Most Creative? ____ (MC)____ **Least** Creative? _ (LC)_____

Best technical skills? _ (BT)____ **Worst** technical skills? ____ (WT)_

Best interpersonal skills? _ (BI)____ **Worst** interpersonal skills?
_ (WI)_____

Most dependable for work and/or attendance? __ (MD)____ **Least** dependable
for work and/or attendance? __ (LD)

Best performing member overall? ____ **Least** performing member overall?

(Perception of Member Performance: BP)
performance: LP)

(Perception of member

Appendix B: Determine Task Competencies for Group Members

Absolute Judgment Format: Knowledge, Skills and Abilities of a "Good" Group Member

# of times listed	Requirements listed for "Good Performing Group Member"
	<u>Knowledge:</u>
3	Basic knowledge of Business or Management
1	Marketing Knowledge
1	MIS knowledge
6	Background Knowledge (personal or real world experience)
3	Understands material
3	Understands class expectations
2	Diverse range of fields and interests (of members)
1	Educational background
1	Literate
	<u>Skills:</u>
9	Communication and Writing
3	Interpersonal/conflict resolution
6	Technical
1	Leadership
2	Listening
2	Time Management
2	Discipline/Accountable
2	Analytical/research
	<u>Abilities:</u>
3	Flexibility
1	Cohesion
2	Listening and understanding/participation
2	Decisiveness/Focus
3	Creativity
4	Dependability/attendance
2	Cooperation
2	Amiable, agreeable
1	reads
1	comprehend material
2	motivation
1	ability to interact with group

Appendix C: Summary of Statistical Tests and Proxies

HP#	Hypothesis	Ind_Var	Ind. Var. Surv#	Med. Var. Surv#	Med. Var. Surv#	Dep. Var.	Dep. Var. Surv#	Stat. Tests
Null 1:	There is no difference between interdependent tasks and independent tasks in a group member's resultant perceptions of learning effectiveness in groups.			Sum Face-to-face hours	C, D, E	learning effectiveness of group work	8, 23, 24	Descriptive, t-test, Linear Regression
Conj. 1:	Interdependent tasks will reduce the impact of another member's personal diversity in a group member's perceptions of learning effectiveness.	gender, age, race, ethnicity, English fluency, class standing	35-90	FTF hours above mean	C, D, E	learning effectiveness of group work	8, 23, 24	Descriptive, t-test, Linear Regression
Conj. 2:	Interdependent tasks will increase the impact of another member's task-related contributions in a group member's perceptions of learning effectiveness in groups.	communication, knowledge, creativity, tech skill, interpersonal, dependable	BC-MD-WC-LD	FTF hours above mean	C, D, E	learning effectiveness of group work	8, 23, 24	Descriptive, t-test, Linear Regression
Conj. 3:	Independent tasks will increase the impact of another member's personal diversity in a group member's perceptions of learning effectiveness.	gender, age, race, ethnicity, English fluency, class standing	35-90	FTF hours below mean	C, D, E	learning effectiveness of group work	8, 23, 24	Descriptive, t-test, Linear Regression
Conj. 4:	Independent tasks will decrease the impact of another member's task-related contributions in a group member's perceptions of learning effectiveness in groups.	communication, knowledge, creativity, tech skill, interpersonal, dependable	BC-MD-WC-LD	FTF hours below mean	C, D, E	learning effectiveness of group work	BP & LP	Descriptive, t-test, Linear Regression
Null 2:	There is no difference between interdependent tasks and independent tasks in a group member's resultant perception of another member's contribution to group performance.			Sum Face-to-face hours	C, D, E	perception of member performance	BP & LP	Descriptive, Duncan's multiple range test, t-test, Logistic Regression
Conj. 5:	Interdependent tasks will reduce the impact of another member's personal diversity in a group member's perceptions of another member's contribution to group performance.	gender, age, race, ethnicity, English fluency, class standing	35-90	FTF hours above mean	C, D, E	perception of member performance	BP & LP	Logistic Regression

Conj. 6:	Interdependent tasks will increase the impact of another member's task-related contributions in perceptions of another member's contribution to group performance.	communication, knowledge, creativity, tech skill, interpersonal, dependable	BC-MD WC-LD	FTF hours above mean	C, D, E	perception of member performance	BP & LP	Logistic Regression
Conj. 7:	Independent tasks will increase the impact of another member's task-related contributions in a group member's perceptions of another member's contribution to group performance.	gender, age, race, ethnicity, English fluency, class standing	35-90	FTF hours below mean	C, D, E	perception of member performance	BP & LP	Logistic Regression
Conj. 8:	Independent tasks will increase the impact of another member's personal diversity in a group member's perceptions of another member's contribution to group performance.	communication, knowledge, creativity, tech skill, interpersonal, dependable	BC-MD WC-LD	FTF hours below mean	C, D, E	perception of member performance	BP & LP	Logistic Regression

Appendix D: Tests of Heteroskedasticity

This was an exploratory study and heteroskedasticity tests were conducted to determine if the institutions and respondents included in the sample differed with respect to personal traits such as gender, age, race, ethnicity or English fluency, or group controls such as group tenure and group size.

Crosstabulation Tables of Personal Traits between Institutions

Several tests were conducted to determine if the institutions included in the sample differed with respect to personal traits such as gender, age, race, ethnicity or English fluency, or group controls such as group tenure, course credit hours and group size. Institutions were crosstabulated by each personal trait variable. There is assumed to be no direct tie between an institution and the respondent's personal traits. Some of these variables are ordinal and the maximum range for all of them is 5 so Kendall's Tau-C and Gamma statistics were computed. (Spearman's coefficient is not as accurate for values under 5 or ordinal variables). There was no difference in the significance level of the two statistics for all crosstabulation comparisons. To determine possible heteroskedasticity among institutional subsets, the adjusted residual error was included in the crosstabulation tables.

Significant differences were found between institutions, especially for race. Morgan State University's respondents were predominately Black (90.2%), which accounted for over half (63%) of all Blacks in the sample. The adjusted residual error for Morgan State/Black was 19.9. Oklahoma institutions contained over 95% of American Indian respondents in the sample, with a proportionately large amount of

Native Americans enrolled at Northeastern State University. The combined adjusted residual error of all Oklahoma institutions' American Indian sample was 6.2. See Table D.3 at the end of this appendix for the entire crosstabulation table of Institution by Race.

Another significant difference between institutions was found for ethnicity. Although only 12.4% of the University of Oklahoma's respondents reported Asian ethnicity, this comprised two-thirds of the total sample's Asian students. The University of Oklahoma also accounted for 50% of the sample's Middle Eastern respondents, but given the large size of the University of Oklahoma's subset (39.3 % of the total sample) this was not a significant number as computed by the adjusted residuals of error. Morgan State respondents had a high percentage of Africans and accounted for 60% of all Africans in the sample's population, compared to their total sample size of 7.4%. Radford University accounted for over 21% of all Europeans, even though it was little more than 8% of the total sample population. St. Mary's of Halifax, Canada, reported a high ratio of Asian and Middle Eastern students for the sample population (13% and 33.3% respectively) given that in total it contributed less than 5% to the overall population sampled, and a relatively low percentage of American respondents (3.5%). Overall, the heteroskedasticity between institutions was weaker for ethnicity than for race, but was still significant (see Table D.2 at end of appendix). Correlation matrices that follow in this appendix show a strong correlation between race and ethnicity, which explains some of the similarities of finding between crosstabulation tables of institutions to race and ethnicity. The crosstabulation table for Institution by Ethnicity

can be found in table D.2 of this appendix. See Table D.1 below for a summary of test statistics and significance used to measure heteroskedasticity among institution subsets.

Table D.1

Differences Among Institutions on Respondent's Personal Traits*

Personal Trait	Test Statistic	Significance
Race	Tau-C = .00408	p=.85196
	Gamma = .01032	p=.85196
Ethnicity	Tau-C = -.01523	p=.40310
	Gamma = -.06369	p=.40310
Gender	Tau-C = .13636	p=.00087
	Gamma = .16983	p=.00087
English	Tau-C = .09637	p=.00003
	Gamma = .06086	p=.00003
Age	Tau-C = -.18721	p=.00000
	Gamma = -.34039	p=.00000
Major	Tau-C = .17135	p=.00000
	Gamma = .22144	p=.00000
Class	Tau-C = -.21237	p=.00000
	Gamma = -.29985	p=.00000

**In order of significance*

Crosstabulation Tables of Group Controls between Institutions

Control variables such as group size and group tenure are often used to mediate effects when comparing other factors that affect behaviors and attitudes of small groups. This study's control variables were crosstabulated by institution to measure any large differences in the way groups were used. Control variables included group tenure, group size, semester vs. quarterly class system, credit hours, group consistency, and type of group formation. Three control variables showed significant difference using the Tau-C and Gamma statistics (See Table D.1 above), but two of the variables that showed this high significance actually reflect a tendency for all universities to use the semester system and to keep groups intact during the semester. Group tenure, the third

control variable, was significantly different between institutions. The actual impact and significance of these control variables is further discussed below and shown in Tables D.5, D.6 and D.7 at the end of this appendix.

The vast majority of institutions use a semester system, and so respondents overwhelmingly reported on groups that had been in the semester system. Of the 800 valid student responses, only 6 reported using the quarter system. The most reports of quarterly classes (3) came from the University of Oklahoma, but still accounted for only 1% of all valid responses from that subset ($n=313$). Table D.5 (at end of appendix) details the crosstabulation of all the institutions by system used. The significance of the control variable that measured the system by quarter or semester reflects the strong preference by all institutions towards the semester system, rather than a difference between institutions.

A similarly contrived significance was found in those reports that involved a class that used more than one group in the semester (see Table D.6 for crosstabulation). The University of Oklahoma accounted for over 39% of the total sample population, influencing the sample's mean in that institution's favor. The University of Oklahoma used only one group per semester over 78% of the time. The range for other institutions was to keep groups intact 70% to 89% of the time. The exception is Radford University, which did have a high percentage of respondents reporting more than one group per class, especially given the small subset size. Overall there was not a wide variance in practice between institutions, yet the Tau-C and Gamma significance level is high.

The remaining control variable that significantly varied among institutions that measured group tenure in weeks (See Table D.7 for crosstabulation). Radford University reported a high subset percentage for groups that lasted 1-2 weeks. This correlates with Radford's practice of using more than one group per class. For the total sample population 39.7% of the respondents were in a group that lasted at least 12-16 weeks (the entire semester). This correlates with the practice of most other institutions to use one group per class. It seems that most students were in one group in an institution using the semester system but groups were not always formed during the first week of the semester. See Table D.2 below for a summary of test statistics and significance used to measure heteroskedasticity of control variables.

Table D.2

Differences Among Institutions on Control Variables*

Control Variable	Test Statistic	Significance
1 or more groups/class	Tau-C = -.01225	p=.71191
	Gamma = -.02405	p=.71191
semester vs. quarterly	Tau-C = .00472	p=.45846
	Gamma = .20932	p=.45846
group tenure	Tau-C = -.04423	p=.11039
	Gamma = -.0592	p=.11039
credit hours	Tau-C = -.02901	p=.02531
	Gamma = -.14169	p=.02531
group size	Tau-C = -.25748	p=.00000
	Gamma = -.33808	p=.00000
group formation	Tau-C = -.19481	p=.00000
	Gamma = -.24817	p=.00000

**In order of significance*

Dealing with Heteroskedasticity

A finding of large differences between institutions, such as those found for race and ethnicity, implies that the error covariance matrix for those variables will no longer

reflect minimum variance. Under these circumstances, the standard errors produced by the least squares procedures would be inappropriate because the least squares estimator will be biased, in turn biasing our regression model. Griffiths, Hill & Judge (1993, page 486) suggest that one way of overcoming this dilemma is to change or transform the model into one with homoskedastic errors. The transformed model could lead to an estimator with more precision than the least squares estimator, as well as appropriate hypothesis testing procedures.

This study is based on theories that use measures of race and ethnicity diversity for *social perception* and *social categorization within learning groups*. If this study were measuring only diversity among institutions, a transformation of race and ethnicity error terms would be appropriate. In this case, transformation is inappropriate. For these theories a more accurate subset than the institution is the group and a more accurate focus is the group's composition. The level of analysis is the individual within the group, rather than the individual within the institution or within the sample population.

Tables for Appendix D

Table D.3
Cross-Tabulation of Institution and
Race

		American					Row
		White	Black	Hispanic	Asian	Indian	Total
Univ. of Oklahoma	Count	222	11	8	39	9	289
	Row %	76.80%	3.80%	2.80%	13.50%	3.10%	39.10%
	Col %	38.80%	15.10%	57.10%	65.00%	42.90%	
	Adj. Res.	-0.2	-4.4	1.4	4.3	0.4	
Oklahoma State University	Count	62	0	1	6	3	72
	Row %	86.10%	0.00%	1.40%	8.30%	4.20%	9.70%
	Col %	10.80%	0.00%	7.10%	10.00%	14.30%	
	Adj. Res.	1.9	-3	-0.3	0.1	0.7	
Northeastern State University	Count	46	6	0	0	8	60
	Row %	76.70%	10.00%	0.00%	0.00%	13.30%	8.10%
	Col %	8.00%	8.20%	0.00%	0.00%	38.10%	
	Adj. Res.	-0.1	0	-1.1	-2.4	5.1	
Millsaps College	Count	34	2	0	1	0	37
	Row %	91.90%	5.40%	0.00%	2.70%	0.00%	5.00%
	Col %	5.90%	2.70%	0.00%	1.70%	0.00%	
	Adj. Res.	2.2	-0.9	-0.9	-1.2	-1.1	
University of Wisconsin	Count	31	2	1	2	0	36
	Row %	86.10%	5.60%	2.80%	5.60%	0.00%	4.90%
	Col %	5.40%	2.70%	7.10%	3.30%	0.00%	
	Adj. Res.	1.3	-0.9	0.4	-0.6	-1.1	
St. Mary's University	Count	26	0	0	9	0	35
	Row %	74.30%	0.00%	0.00%	25.70%	0.00%	4.70%
	Col %	4.50%	0.00%	0.00%	15.00%	0.00%	
	Adj. Res.	-0.4	-2	-0.8	3.9	-1	

Table D.3 Continued
Cross-Tabulation of
Institution and Race

		American					Row
		White	Black	Hispanic	Asian	Indian	Total
St. John's University	Count	72	1	0	2	0	75
	Row %	96.00%	1.30%	0.00%	2.70%	0.00%	10.10%
	Col %	12.60%	1.40%	0.00%	3.30%	0.00%	
	Adj. Res.	4.1	-2.6	-1.3	-1.8	-1.6	
Morgan State University	Count	3	46	1	0	1	51
	Row %	5.90%	90.20%	2.00%	0.00%	2.00%	6.90%
	Col %	0.50%	63.00%	7.10%	0.00%	4.80%	
	Adj. Res.	-12.6	19.9	0	-2.2	-0.4	
Florida State University	Count	21	1	2	1	0	25
	Row %	84.00%	4.00%	8.00%	4.00%	0.00%	3.40%
	Col %	3.70%	1.40%	14.30%	1.70%	0.00%	
	Adj. Res.	0.8	-1	2.3	-0.8	-0.9	
Radford University	Count	55	4	1	0	0	60
	Row %	91.70%	6.70%	1.70%	0.00%	0.00%	8.10%
	Col %	9.60%	5.50%	7.10%	0.00%	0.00%	
	Adj. Res.	2.8	-0.9	-0.1	-2.4	-1.4	
Column Total	Count	572	73	14	60	21	740
	Percentage	77.3%	9.9%	1.9%	8.1%	2.8%	100.0%

Table D.4

Cross-Tabulation of Institution and Ethnicity

		American	European	Asian	Middle Eastern	African	Row Total
Univ. of Oklahoma	Count	243	7	36	3	1	290
	Row %	83.80%	2.40%	12.40%	1.00%	0.30%	40.10%
	Col %	38.80%	25.00%	66.70%	50.00%	10.00%	
	Adj. Res.	-1.7	-1.7	4.1	0.5	-2	
Oklahoma State University	Count	66	0	6	0	0	72
	Row %	91.70%	0.00%	8.30%	0.00%	0.00%	9.90%
	Col %	10.50%	0.00%	11.10%	0.00%	0.00%	
	Adj. Res.	1.4	-1.8	0.3	-0.8	-1.1	
Northeastern State University	Count	59	0	0	1	1	61
	Row %	96.70%	0.00%	0.00%	1.60%	1.60%	8.40%
	Col %	9.40%	0.00%	0.00%	16.70%	10.00%	
	Adj. Res.	2.4	-1.6	-2.3	0.7	0.2	
Millsaps College	Count	34	2	0	0	1	37
	Row %	91.90%	5.40%	0.00%	0.00%	2.70%	5.10%
	Col %	5.40%	7.10%	0.00%	0.00%	10.00%	
	Adj. Res.	1	0.5	-1.8	-0.6	0.7	
University of Wisconsin	Count	33	1	1	0	1	36
	Row %	91.70%	2.80%	2.80%	0.00%	2.80%	5.00%
	Col %	5.30%	3.60%	1.90%	0.00%	10.00%	
	Adj. Res.	0.9	-0.3	-1.1	-0.6	0.7	
St. Mary's University	Count	22	2	7	2	0	33
	Row %	66.70%	6.10%	21.20%	6.10%	0.00%	4.60%
	Col %	3.50%	7.10%	13.00%	33.30%	0.00%	
	Adj. Res.	-3.4	0.7	3.1	3.4	-0.7	

Table D.4 Continued
Cross-Tabulation of Institution and Ethnicity

		American	European	Asian	Middle Eastern	African	Row Total
St. John's University	Count	52	6	2	0	0	60
	Row %	86.70%	10.00%	3.30%	0.00%	0.00%	8.30%
	Col %	8.30%	21.40%	3.70%	0.00%	0.00%	
	Adj. Res.	0	2.6	-1.3	-0.7	-1	
Morgan State University	Count	41	3	0	0	6	50
	Row %	82.00%	6.00%	0.00%	0.00%	12.00%	6.90%
	Col %	6.50%	10.70%	0.00%	0.00%	60.00%	
	Adj. Res.	-1	0.8	-2.1	-0.7	6.7	
Florida State University	Count	23	1	1	0	0	25
	Row %	92.00%	4.00%	4.00%	0.00%	0.00%	3.50%
	Col %	3.70%	3.60%	1.90%	0.00%	0.00%	
	Adj. Res.	0.8	0	-0.7	-0.5	-0.6	
Radford University	Count	53	6	1	0	0	60
	Row %	88.30%	10.00%	1.70%	0.00%	0.00%	8.30%
	Col %	8.50%	21.40%	1.90%	0.00%	0.00%	
	Adj. Res.	0.4	2.6	-1.8	-0.7	-1	
Column Total	Count	626	28	54	6	10	724
	Percentage	86.5%	3.9%	7.5%	8.0%	1.4%	100.0%

Table D.5
Cross-Tabulation of Institution and Class System

		quarter	semester	Row Total
Univ. Okla.	Count	3	310	313
	Row Pct	1.00%	99.00%	39.10%
	Col Pct	50.00%	39.00%	
	Tot Pct	0.40%	38.80%	
	Adj Res	0.5	-0.5	
Okla. State	Count	1	75	76
	Row Pct	1.30%	98.70%	9.50%
	Col Pct	16.70%	9.40%	
	Tot Pct	0.10%	9.40%	
	Adj Res	0.6	-0.6	
N.E. Okla	Count	0	62	62
	Row Pct	0.00%	100.00%	7.80%
	Col Pct	0.00%	7.80%	
	Tot Pct	0.00%	7.80%	
	Adj Res	-0.7	0.7	
Millsaps	Count	0	41	41
	Row Pct	0.00%	100.00%	5.10%
	Col Pct	0.00%	5.20%	
	Tot Pct	0.00%	5.10%	
	Adj Res	-0.6	0.6	
Wisconsin	Count	0	35	35
	Row Pct	0.00%	100.00%	4.40%
	Col Pct	0.00%	4.40%	
	Tot Pct	0.00%	4.40%	
	Adj Res	-0.5	0.5	
St. Mary's	Count	0	35	35
	Row Pct	0.00%	100.00%	4.40%
	Col Pct	0.00%	4.40%	
	Tot Pct	0.00%	4.40%	
	Adj Res	-0.5	0.5	

		Row	
		quarter	semester
		Count	Total
St. John's	Count	2	76
	Row Pct	2.60%	97.40%
	Col Pct	33.30%	9.60%
	Tot Pct	0.30%	9.50%
	Adj Res	2	-2
Morgan	Count	0	59
	Row Pct	0.00%	100.00%
	Col Pct	0.00%	7.40%
	Tot Pct	0.00%	7.40%
	Adj Res	-0.7	0.7
Florida State	Count	0	27
	Row Pct	0.00%	100.00%
	Col Pct	0.00%	3.40%
	Tot Pct	0.00%	3.40%
	Adj Res	-0.5	0.5
Radford U.	Count	0	74
	Row Pct	0.00%	100.00%
	Col Pct	0.00%	9.30%
	Tot Pct	0.00%	9.30%
	Adj Res	-0.8	0.8
		6	794
Column			800
Total		0.80%	99.30%
			100.0
			0%

Chi-Square	Value	DF	Significance
Pearson	6.47442	9	0.69166
Likelihood Ratio	7.56164	9	0.57885
Linear-by-Linear	0.39139	1	0.53157

Association

Minimum Expected Frequency - 0.203

Cells with Expected Frequency < 5 - 10 of 20 (50.0%)

		Approximate		
Statistic	Value	ASE1	Val/ASE0	Significance
Kendall's Tau-c	0.00472	0.00636	0.74139	0.45846
Gamma	0.20932	0.28433	0.74139	0.45846
Pearson's R	0.02213	0.03108	0.62537	0.53191
Spearman				
Correlation	0.02447	0.03188	0.69159	0.48939
Number of Missing Observations:		22		

Table D.6
Cross-Tabulation of Institution and Number of Groups per Semester

		>1 Group/ Semester	1 Group/ Semester	Row Total
Univ. Okla.	Count	67	246	313
	Row Pct	21.40%	78.60%	39.20%
	Col Pct	41.90%	38.60%	
	Tot Pct	8.40%	30.80%	
	Adj Res	0.8	-0.8	
Okla. State	Count	10	67	77
	Row Pct	13.00%	87.00%	9.60%
	Col Pct	6.30%	10.50%	
	Tot Pct	1.30%	8.40%	
	Adj Res	-1.6	1.6	
N.E. Okla	Count	10	52	62
	Row Pct	16.10%	83.90%	7.80%
	Col Pct	6.30%	8.20%	
	Tot Pct	1.30%	6.50%	
	Adj Res	-0.8	0.8	
Millsaps	Count	10	30	40
	Row Pct	25.00%	75.00%	5.00%
	Col Pct	6.30%	4.70%	
	Tot Pct	1.30%	3.80%	
	Adj Res	0.8	-0.8	
Wisconsin	Count	6	30	36
	Row Pct	16.70%	83.30%	4.50%
	Col Pct	3.80%	4.70%	
	Tot Pct	0.80%	3.80%	
	Adj Res	-0.5	0.5	
St. Mary's	Count	4	29	33
	Row Pct	12.10%	87.90%	4.10%
	Col Pct	2.50%	4.50%	
	Tot Pct	0.50%	3.60%	
	Adj Res	-1.2	1.2	
St. John's	Count	14	64	78
	Row Pct	17.90%	82.10%	9.80%
	Col Pct	8.80%	10.00%	
	Tot Pct	1.80%	8.00%	
	Adj Res	-0.5	0.5	

		>1 Group/ Semester	1 Group/ Semester	Row Total
Morgan	Count	14	45	59
	Row Pct	23.70%	76.30%	7.40%
	Col Pct	8.80%	7.10%	
	Tot Pct	1.80%	5.60%	
	Adj Res	0.7	-0.7	
Florida State	Count	3	24	27
	Row Pct	11.10%	88.90%	3.40%
	Col Pct	1.90%	3.80%	
	Tot Pct	0.40%	3.00%	
	Adj Res	-1.2	1.2	
Radford U.	Count	22	51	73
	Row Pct	30.10%	69.90%	9.10%
	Col Pct	13.80%	8.00%	
	Tot Pct	2.80%	6.40%	
	Adj Res	2.3	-2.3	
Column		160	638	798
Total		20.10%	79.90%	100.00%

Statistic	Value	ASE1	Val/ASE0	Approximate Significance
Kendall's Tau-c	-0.01225	0.03317	-0.36929	0.71191
Gamma	-0.02405	0.06487	-0.36929	0.71191
Pearson's R	-0.02862	0.03689	-0.80766	0.41953
Spearman				
Correlation	-0.01369	0.03707	-0.38638	0.69932
Number of Missing Observations:		24		

Table D.7
Cross-Tabulation of Institution And Group Tenure

Length Respondent worked in Group:		1-2 Weeks	3-4 Weeks	5-8 weeks	8-12 weeks	12-16 weeks	Row Total
Univ. Okla.							
	Count	20	52	61	53	131	317
	Row Pct	6.30%	16.40%	19.20%	16.70%	41.30%	39.20%
	Col Pct	30.80%	43.00%	38.90%	36.80%	40.80%	
	Tot Pct	2.50%	6.40%	7.50%	6.60%	16.20%	
	Adj Res	-1.5	0.9	-0.1	-0.7	0.7	
Okla. State							
	Count	7	10	8	14	37	76
	Row Pct	9.20%	13.20%	10.50%	18.40%	48.70%	9.40%
	Col Pct	10.80%	8.30%	5.10%	9.70%	11.50%	
	Tot Pct	0.90%	1.20%	1.00%	1.70%	4.60%	
	Adj Res	0.4	-0.5	-2.1	0.1	1.7	
N.E. Okla							
	Count	6	16	11	7	22	62
	Row Pct	9.70%	25.80%	17.70%	11.30%	35.50%	7.70%
	Col Pct	9.20%	13.20%	7.00%	4.90%	6.90%	
	Tot Pct	0.70%	2.00%	1.40%	0.90%	2.70%	
	Adj Res	0.5	2.5	-0.3	-1.4	-0.7	
Millsaps							
	Count	3	5	11	8	13	40
	Row Pct	7.50%	12.50%	27.50%	20.00%	32.50%	5.00%
	Col Pct	4.60%	4.10%	7.00%	5.60%	4.00%	
	Tot Pct	0.40%	0.60%	1.40%	1.00%	1.60%	
	Adj Res	-0.1	-0.5	1.3	0.4	-1	
Wisconsin							
	Count	1	2	6	12	15	36
	Row Pct	2.80%	5.60%	16.70%	33.30%	41.70%	4.50%
	Col Pct	1.50%	1.70%	3.80%	8.30%	4.70%	
	Tot Pct	0.10%	0.20%	0.70%	1.50%	1.90%	
	Adj Res	-1.2	-1.6	-0.4	2.5	0.2	
St. Mary's							
	Count	3	2	12	5	15	37
	Row Pct	8.10%	5.40%	32.40%	13.50%	40.50%	4.60%
	Col Pct	4.60%	1.70%	7.60%	3.50%	4.70%	
	Tot Pct	0.40%	0.20%	1.50%	0.60%	1.90%	
	Adj Res	0	-1.7	2	-0.7	0.1	

Table D.7 Continued
Cross-Tabulation of Institution And Group Tenure

Length Respondent

worked in Group:		1-2 Weeks	3-4 Weeks	5-8 weeks	8-12 weeks	12-16 weeks	Row
St. John's							
	Count	3	7	12	17	39	78
	Row Pct	3.80%	9.00%	15.40%	21.80%	50.00%	9.70%
	Col Pct	4.60%	5.80%	7.60%	11.80%	12.10%	
	Tot Pct	0.40%	0.90%	1.50%	2.10%	4.80%	
	Adj Res	-1.4	-1.6	-1	1	2	
Morgan							
	Count	4	13	14	10	19	60
	Row Pct	6.70%	21.70%	23.30%	16.70%	31.70%	7.40%
	Col Pct	6.20%	10.70%	8.90%	6.90%	5.90%	
	Tot Pct	0.50%	1.60%	1.70%	1.20%	2.40%	
	Adj Res	-0.4	1.5	0.8	-0.2	-1.3	
Florida State							
	Count	2	4	6	8	8	28
	Row Pct	7.10%	14.30%	21.40%	28.60%	28.60%	3.50%
	Col Pct	3.10%	3.30%	3.80%	5.60%	2.50%	
	Tot Pct	0.20%	0.50%	0.70%	1.00%	1.00%	
	Adj Res	-0.2	-0.1	0.3	1.5	-1.2	
Radford U.							
	Count	16	10	16	10	22	74
	Row Pct	21.60%	13.50%	21.60%	13.50%	29.70%	9.20%
	Col Pct	24.60%	8.30%	10.20%	6.90%	6.90%	
	Tot Pct	2.00%	1.20%	2.00%	1.20%	2.70%	
	Adj Res	4.5	-0.4	0.5	-1	-1.8	
	Column	65	121	157	144	321	808
	Total	8.00%	15.00%	19.40%	17.80%	39.70%	100.00%

Statistic	Value	ASE1	Val/ASE0	Approximate Significance
Kendall's Tau-c	-0.04423	0.0277	-1.59642	0.11039
Gamma	-0.0592	0.03694	-1.59642	0.11039
Pearson's R	-0.05828	0.0363	-1.65734	0.09784
Spearman Correlation	-0.05704	0.03563	-1.622	0.10519
Number of Missing Observations:			14	

Table D.8
Cross Tabulation of Gender by completed surveys

MALE	Count	213	183	396 Row
	Row %	53.80%	46.20%	52.90% Total
	Col %	55.80%	49.90%	
	Adj. Res.	1.6	-1.6	
FEMALE	Count	169	184	353
	Row %	47.90%	52.10%	47.10%
	Col %	44.20%	50.10%	
	Adj. Res.	-1.6	1.6	
	Column	382	367	749
	Total	51.00%	49.00%	100.00%

	Value	ASE1	Approximate Val/ASE0	Significance
Kendall' s Tau-c	0.05893	0.03641	1.61839	. 10558
Gamma	0.11787	0.07231	1.61839	. 10558

Number of Missing Observations: 73

Table D.9

Missing Data and Attrition RateReturned Surveys: **822**

Surveys that include demographic data:

LEAST	MOST	TTL	% of total
382	367	749	91%
51%	49%	100%	

Surveys that include task competency data

on Positive Traits:				on Negative Traits:					
	LEAST	MOST	TTL		LEAST	MOST	TTL		
Best Comm.	341	339	680	Worst Comm.	332	322	654		
Most Knowledge	332	329	661	Least Knowledge	325	307	632		
Most Creative	330	337	667	Least Creative	320	307	627		
Best Technical	332	338	670	Worst Technical	316	312	628		
Best Interpersonal	330	337	667	Worst Interpersonal	317	306	623		
Most Dependable	328	324	652	Least Dependable	324	297	621		
			% of total				% of total		
Average:	332	334	666	81%	322	309	631	77%	
T-Test	0.00								
BEST MEMBER	329	325	654	80%	WORST MEMBER	324	293	617	75%

Table D.10

Regression Model for Ttl hrs (Task Interactivity) and Control Variables

Population Description of Variable		Parameter Est	t Value	Pr > t
Least Positive	Intercept	0.06186	0.13	0.8951
	Total hours face to face	-0.00017	-0.75	0.4548
	Class standing at the time	0.00674	0.45	0.6507
	Were you in more than one group?	-0.00977	-0.33	0.739
	How many weeks did group work?	-0.00388	-0.43	0.6638
	How were groups formed?	-0.00023	-0.02	0.9818
	Quarter or Semester system?	0.2226	0.99	0.3227
	How many Credit Hrs. was class worth?	-0.012	-0.39	0.6952
	How many members in your group?	0.0072	0.73	0.4637
Most Positive	Intercept	-0.1985	-0.44	0.6576
	Total hours face to face	-0.00008	-0.51	0.6124
	Class standing at the time	0.00765	0.47	0.6372
	Were you in more than one group?	0.03578	1.2	0.232
	How many weeks did group work?	0.00027	0.03	0.9757
	How were groups formed?	-0.00577	-0.62	0.534
	Quarter or Semester system?	0.3069	1.42	0.1559
	How many Credit Hrs. was class worth?	0.01977	0.89	0.3717
	How many members in your group?	-0.01358	-1.32	0.1856

Appendix E: Tests of Multicollinearity

As mentioned in the body of the study, if any correlation is found among independent variables, a linear dependency and therefore a bias in the findings is likely. A potentially harmful collinear relationship is indicated when a correlation coefficient between two explanatory variables is greater than 0.8 or 0.9 (Griffiths, et. al, 1993, page 435). The issue of multicollinearity is addressed here using diagnostic tests of condition indices and variance inflation factors, as well as correlation coefficient and canonical correlation analysis-of independent variables (see Appendix E). In addition, discriminate analysis of several variables found no obvious clusters (see Appendix F).

Possible Correlation of the set of Personal Traits

D_scores are the actual form the personal variables take when being entered into statistical models, so issues of collinearity among personal traits were addressed using these scores. It is no surprise that like the original personal trait variables, personal trait d_score measures of race, ethnicity and fluency are moderately correlated. The correlation coefficients and significance levels of personal d_score variables are summarized below in Table E.1.

Table E.1

Correlation Coefficients Among Personal Trait D-Scores

	D_GENDER	D_AGE	D_RACE	D_FLUENT	D_ETHNIC	D_CLASS
D_GENDER	1					
	$\rho=0$					
D_AGE	0.1516	1				
	$\rho=0.0001$	$\rho=0$				
D_RACE	0.2143	0.2105	1			
	$\rho=0.0001$	$\rho=0.0001$	$\rho=0$			
D_FLUENT	0.1173	0.1685	0.4585	1		
	$\rho=0.0031$	$\rho=0.0001$	$\rho=0.0001$	$\rho=0$		
D_ETHNIC	0.1419	0.1904	0.5818	0.6043	1	
	$\rho=0.0003$	$\rho=0.0001$	$\rho=0.0001$	$\rho=0.0001$	$\rho=0$	
D_CLASS	0.0327	0.2354	0.0505	0.1383	0.0789	1
	$\rho=0.4114$	$\rho=0.0001$	$\rho=0.2049$	$\rho=0.0005$	$\rho=0.0474$	$\rho=0$

Possible Correlation of the set of Task Traits

Task trait variables had only 3 possible values; 0, 0.5 and 1. Despite the limited range, all of the task traits had low correlation coefficients. Task trait correlation coefficients and significance levels are shown below in Table E.2.

Table E.2

Correlation Coefficients Among Task Trait Values

	COMMUNIC	KNOWLEDG	CREATIVE	TECHNICL	INTRPSNL	DEPENDBL
COMMUNIC	1					
	0					
KNOWLEDG	0.18913	1				
	$\rho=0.0001$	$\rho=0$				
CREATIVE	0.10115	0.12313	1			
	$\rho=0.011$	$\rho=0.0019$	$\rho=0$			
TECHNICL	0.11332	0.24935	0.08237	1		
	$\rho=0.0043$	$\rho=0.0001$	$\rho=0.0384$	$\rho=0$		
INTRPSNL	0.26138	0.10015	0.22546	-0.0071	1	
	$\rho=0.0001$	$\rho=0.0118$	$\rho=0.0001$	$\rho=0.8586$	$\rho=0$	
DEPENDBL	0.24167	0.26103	-0.0309	0.12457	0.16758	1
	$\rho=0.0001$	$\rho=0.0001$	$\rho=0.438$	$\rho=0.0017$	$\rho=0.0001$	$\rho=0$

Although none of the correlations exceed the 0.8 or 0.9 standard given by Griffith, due to the high number of moderately correlated d_score variables within the personal type of trait a possibility of multicollinearity exists. In addition, the possibility of multicollinearity between the different sets of types of traits must be examined.

Correlations of Independent Variables between Trait Types

The correlations between the individual variables measuring personal dispersion scores and task traits were low, with none exceeding 0.1087 (d_fluent and creativity). These low correlations imply the study's individual measures are not interdependent between types of traits and are good measures of different constructs. Table E.3 summarizes the correlations between personal traits and task traits.

Table E.3

Correlations Between Distance Scores of Personal and Task Variables

	COMMUN.	KNOWLEDG	CREATIVE	TECHNICL	INTRPSNL	DEPENDBL
D_CLASS	0.0283	-0.0229	0.0289	-0.0069	0.0145	0.0090
D_AGE	0.0381	0.0285	0.0932	0.0481	0.0261	-0.0003
D_GENDER	0.1044	0.0321	0.0365	0.0755	0.0581	0.0205
D_FLUENT	0.0216	0.0077	0.1087	-0.0109	0.0308	-0.0150
D_ETHNIC	0.0735	0.0083	0.1003	-0.0351	0.0437	-0.0211
D_RACE	0.0680	0.0361	0.0733	0.0430	0.0299	0.0704

In the study, these variables are used as regressors to model the affect of personal traits or task contributions, given a type of task, on learning effectiveness or another member's perceived performance. When a regressor is a nearly linear combination of other regressor in the model, the affected estimates are unstable and have high standard errors, possibly biasing the final results. The tests of correlation did not find any danger of bias due to high standard error.

Canonical Correlation

A canonical correlation was used to further test for independence between the two types of traits. Canonical correlation is a technique for analyzing the relationship between two sets of variables, in this case, personal and trait. Each set can contain several variables. In this study, the personal trait set contains distance scores of gender, age, race, ethnicity, fluency, major and class standing, while the task trait set contains values of communication, knowledge, creativity, technical skills, personal skills, and dependability. The procedure tests the hypothesis that each canonical correlation is zero in the sample population (SAS Institute, Inc., 1994, page 367). Stated simply, the assumption being tested is that there is no dependence between the sets of personal traits and task traits using distance score measures. Table E.4 summarizes the canonical correlation analysis of personal d_scores and task variables.

Table E.4

Canonical Correlation Analysis of Personal D-scores to Task Values

	Canonical Correlation	Adjusted Canonical Correlation	Approx Standard Error	Squared Canonical Correlation	Likeli- hood Ratio	Approx F	Num DF	Den DF	PR > F
1	0.158	.	0.039	0.025	0.942	1.0446	36	2725.37	0.3966
2	0.139	.	0.039	0.019	0.966	0.8702	25	2308.42	0.6495
3	0.098	.	0.039	0.010	0.985	0.5965	16	1900.88	0.8888
4	0.068	.	0.040	0.005	0.994	0.3905	9	1516.37	0.9402
5	0.030	.	0.040	0.001	0.999	0.1609	4	1248.00	0.9581
6	0.012	.	0.040	0.000	1.000	0.0834	1	625.00	0.7729

The highest canonical correlation is only 0.1581, but is larger than the highest between set correlation (d_fluent and creative) of 0.1087 (see table 4.17). The probability level for the null hypothesis that all the canonical correlations are 0 in the population is 0.8012, so no firm conclusions can be drawn from the F statistic. On the

other hand, the likelihood ratio for the hypothesis that the current canonical correlation and all smaller ones are 0 in the population is 0.9416. (This is the same value as that given for Wilk's Lambda, which is the likelihood ratio for all canonical correlations in the model.)

All the adjusted canonical correlations are printed as missing, which combined with the likelihood ratio of 0.9416 means that adjacent canonical correlations are close to zero. The remaining canonical correlations are all below a 0.15 level of correlation. Combined with the low significance level for remaining correlations (Prob. > F 0.6495), and missing adjusted canonical correlations, these correlation levels are not worth considering. While the F statistic was not strong, there seems to be no reason to believe the two sets are collinear.

Collinearity Diagnosis

In addition to correlation coefficients, collinearity diagnostics proposed by Belsley, Kuh, and Welsch (1980) such as condition indices and variance inflation factors were used to test for multicollinearity. The condition indices are the square roots of the ratio of the largest eigenvalue to each individual eigenvalue (SAS Institute, Inc. 1994 page 1417). When the largest number is greater than 20-30, the data are said to be ill-conditioned. The largest condition index of the personal trait d_scores is 5.9027, while the largest of the task trait values is 12.1336. Using the condition index, the independent variables do not appear to be collinear. Table E.5 summarizes the eigenvalues and condition indices for both personal trait d_scores and task trait values.

Table E.5

Collinearity Diagnostics on D Scores: Eigenvalues and Condition Indices

Task		Personal	
Eigenvalue	Condition Index	Eigenvalue	Condition Index
7.09846	1	4.5411	1
0.21638	5.7277	0.8377	2.3283
0.19076	6.1001	0.4955	3.0275
0.14056	7.1065	0.4567	3.1533
0.12555	7.5192	0.31009	3.8268
0.10965	8.0458	0.22585	4.4571
0.07043	10.0393	0.1303	5.9027
0.04822	12.1336		

Variance inflation factors measure the variances of the parameter estimates due to collinearities that exist among the regressor (dependent) variables. While there are no formal criteria for deciding if a VIF is large enough to affect the predicted values (SAS Institute, Inc. 1994 page 1417) all of the test scores were under 2. Using the variance inflation factors the test for collinearity did not give any evidence of multicollinearity. Summary tables of VIF can be found in Table E.6.

Table E.6

Variance Inflation Factors

Parameter Estimates Variance of Inflation						
<u>Personal D-Scores</u>						
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T	Variance Inflation
D_GENDER	1	0.0154	0.1579	0.0970	0.9225	1.0771
D_AGE	1	0.0690	0.0769	0.8960	0.3704	1.1370
D_RACE	1	0.1080	0.0601	1.7960	0.0729	1.5834
D_FLUENT	1	-0.1532	0.0891	-1.7190	0.0860	1.5747
D_ETHNIC	1	0.0323	0.0847	0.3810	0.7032	1.6986
D_MAJOR	1	0.0211	0.0583	0.3620	0.7178	1.0860
D_CLASS	1	-0.0651	0.0952	-0.6840	0.4943	1.1348
<u>Task Values</u>						
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T	Variance Inflation
COMMUNIC	1	-0.038352	0.15981	-0.24	0.8104	1.21729
KNOWLEDG	1	0.041076	0.18095	0.227	0.8205	1.29298
CREATIVE	1	0.034191	0.15499	0.221	0.8255	1.09915
TECHNICL	1	-0.178771	0.15771	-1.134	0.2574	1.11974
INTRPSNL	1	0.003897	0.16502	0.024	0.9812	1.14998
DEPENDBL	1	-0.305662	0.18301	-1.67	0.0954	1.28749
OVRALL	1	-0.076607	0.22496	-0.341	0.7336	1.65745

Overall, 2 diagnostic tests for multicollinearity were used; condition indices and variance inflation factors. Both tests indicated no collinearity.

Appendix F: Discriminant Analysis

The hypotheses of this study are generally testing the impact of the type of task or assignment on students' perceptions of the overall group experience, learning experience, and other group members. Empirical relationships between variables were explored using discriminant analysis. This exploratory statistical testing focused on finding which classes of personal and task variables showed the most difference when regressed on learning experience.

Personal traits' empirical relationship to learning experience

This study sub-divided students' traits into two types of independent variables - personal and task. Discriminant analysis classified by the learning experience composite score and regressed on the student's personal traits found no significant impact on perceptions of the group learning experience. Findings are summarized in Table F.1.

Table F.1

Discriminant Analysis of Learning Measure Regressed on Observer's Personal Traits*

Personal Trait	R² Test Statistic	F Test Statistic	Significance
English	R-Squared = .019580	F = .9572	p=.4963
Ethnicity	R-Squared = .019180	F = .9372	p=.5179
Major	R-Squared = .018755	F = .9161	p=.5410
Class	R-Squared = .018537	F = .9052	p=.5529
Race	R-Squared = .017313	F = .8444	p=.6205
Gender	R-Squared = .013813	F = .6713	p=.8035
Age	R-Squared = .012403	F = .6019	p=.8646

**In order of significance*

This study will also explore the student's task traits' empirical relationship to learning experience using discriminant analysis.

Task's empirical relationship to learning experience

The study used discriminant analysis to examine group assignments' impact on perceptions of learning experience. The composite score 'learning experience' was classified and regressed by the type of group assignment required. Group exams were empirically related to positive perceptions of the learning experience, as were group presentations. Group exams accounted for almost 4.56% of the variance in the perception of learning experience and had a high significance level ($p > .0005\%$). Group presentations were not as explanatory or as significant, but were significant at the 10% level. A summary of this analysis is found in Table F.2.

Table F.2

Discriminant Analysis of Learning Measure Regressed on Type of Task *

Group Task	R² Test Statistic	F Test Statistic	Significance
Exams	R-Squared = .045643	F = 2.7568	p=.0005
Presentations	R-Squared = .029082	F = 1.7266	p=.0459
Research Projects	R-Squared = .021616	F = 1.2735	p=.2177
Written Papers	R-Squared = .011843	F = .06908	p=.7848
Case Studies	R-Squared = .011778	F = 0.6870	p=.7885

**In order of significance*

Task's empirical relationship to type of experience reported

Discriminant analysis is used as a statistical test when the dependent variable is dichotomous. (Classifying the dependent variables produces dummy variables in SAS, which allowed us to run the previous discriminant analysis). This study had built in dichotomous dependent measures of student's perceptions of learning experience. The survey was either reporting a 'Most' or 'Least' positive group experience. The analysis regressed two dichotomous types of experience by type of task. In this analysis only group exams had any significant relationship to perceptions of a positive group experience.

There are two major limitations to using the survey type as a dependent measure of perceptions of experience. The first is that the 'most' or 'least' perception category was forced onto the respondent by the random sampling method. It is possible a student with highly positive group experiences was required to fill out the 'least positive' survey. Secondly, the survey instructions are a single way to measure perception. Although the survey instructions had high face validity, the composite score for

learning experience has a higher strength of validity and scalability (1=low to 5=high).

Classifying the difference among tasks by survey type gives an interesting overview, but it is constrained and therefore not as strong as using a true construct of group experience.

Table F.3

Discriminant Analysis of Report Type Regressed on Type of Task

Group Task	R ² Test Statistic	F Test Statistic	Significance
Exams	R-Squared = 0.011005	F = 9.1248	p=.0026
Presentations	R-Squared = 0.002062	F = 1.6943	p=.1934
Research Projects	R-Squared = 0.000113	F = 0.0928	p=.7607
Written Papers	R-Squared = 0.001203	F = 0.9877	p=.3206
Case Studies	R-Squared = 0.000033	F = 0.0269	p=.8698

Summary

Discriminant analysis was used as an exploratory tool to view the study's variables' impact on student perceptions of overall group experience and group learning experience. Personal attributions or traits had no significant direct relationship to a student's perceptions concerning their group learning experiences. Without including controls such as group tenure, hours spent as a group interacting, or type of task, the analysis has little explanatory power for hypothesis one or two. This finding does establish that no particular personal trait is likely to bias the mediating influence (if any) of the type of task. Discriminant analysis did find an interdependent task (exams) to be significantly related to measures of learning experience and overall group experience, while independent tasks were not. Presentations were significantly related to learning experience, but not to reports of "Most Positive" overall group experiences.

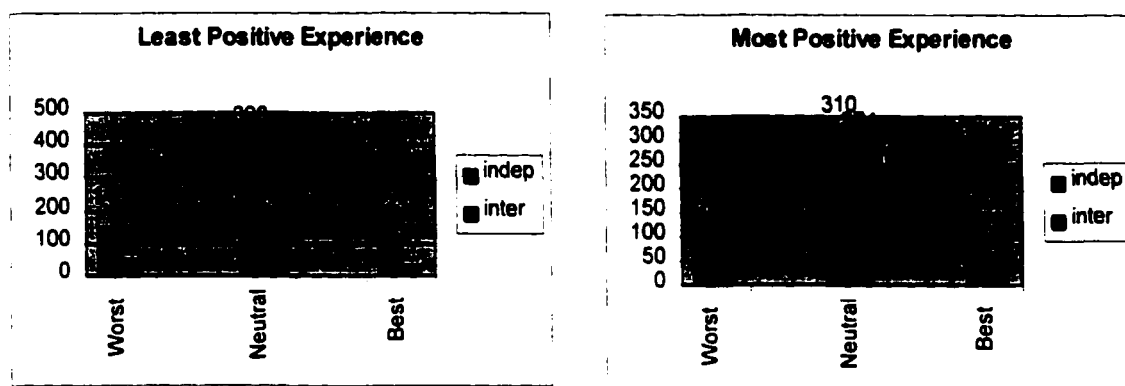
Appendix G: Frequencies of task type and overall performance

Frequency counts and tables of task type and overall performance scores were tested for association using the Mantel-Haenszel and the Pearson chi-square statistic. The Mantel-Haenszel test statistic, like the Logit model, is used for ordinal data and is designed to detect a linear association. The Pearson chi-square statistic, while less powerful for linear models, is able to detect any type of association (SAS Institute, 1994, page 855).

As mentioned before, interdependent tasks were reported more often for the population reporting on their Most Positive Group Experience (44%) than for the population of Least Positive Group Experience (24%) by almost 2:1.

The difference in task's impact and perception of other members' performance was not significant for the Least Positive population, which had a probability of association of 0.426 for the Pearson chi-square and 0.255 for the Mantel-Haenszel chi-square. The population reporting on their Most Positive Group Experience had mixed results between the Pearson chi-square, which showed a significant level of association between task type of performance scores (0.079) and the Mantel-Haenszel chi-square, which was not significant. This may imply a non-linear association. See Figure G.1 below for a graphic comparison of the two populations.

Figure G.1

Frequency of Performance Scores in Least and Most Positive Populations

As noted in the body of this study, these tests may not be appropriate due to unequal cell sizes.

Appendix H: Confidence Intervals for Null Hypothesis Two

<u>95% Confidence Intervals</u>					
Least Positive					
Group Experiences	Lower 95% CL for Mean	Upper 95% CL for Mean		Lower 95% CL for Mean	Upper 95% CL for Mean
Consistency	1.777	1.8622	Consistency	1.777	1.8622
d_gender	0.4586	0.5236	communication	0.6264	0.6955
d_age	0.411	0.5395	knowledge	0.5838	0.6443
d_race	0.251	0.3228	creative	0.5616	0.6259
d_fluent	0.4065	0.5503	technical	0.5832	0.645
d_ethnic	0.1925	0.2606	interpersonal	0.648	0.7113
d_class	0.3521	0.4566	dependable	0.619	0.681
Most Positive					
Group Experiences	Lower 95% CL for Mean	Upper 95% CL for Mean		Lower 95% CL for Mean	Upper 95% CL for Mean
Consistency	1.7632	1.8526	Consistency	1.7633	1.8526
d_gender	0.4696	0.533	communication	0.5763	0.6417
d_age	0.4403	0.5826	knowledge	0.557	0.6193
d_race	0.2357	0.3078	creative	0.5461	0.6141
d_fluent	0.3266	0.4567	technical	0.5567	0.626
d_ethnic	0.1826	0.25	interpersonal	0.5998	0.663
d_class	0.342	0.4563	dependable	0.578	0.6368

Appendix I: Assignment Characteristics

The study examined the frequency and correlation of the type of group assignment required to the student's perception of "Least" vs. "Most" positive group experience. As mentioned, random sampling was designed to produce a 50/50-response rate. In actuality, surveys of least positive experiences accounted for 51% of the sample while surveys of most positive experiences accounted for 49% of the sample.

Frequency and Correlation of Types of Assignments

Those students that reported on a least positive experience completed fewer group exams ($\mu = .1833$) than those that reported a most positive experience ($\mu = .27144$). Conversely, writing a group paper was more frequently required when students reported a least positive experience ($\mu = .24048$) than most positive experience ($\mu = .21144$). Table I.1 summarizes the number of assignments and their mean according to the type of survey completed. Table I.2 gives the correlation coefficients and significance levels. While the frequencies and correlation coefficients support the study's expectations for the impact of assignments on perceptions, the differences between types of assignments are not strong. Discriminant analysis, reviewed in Appendix F, is a stronger test of the differences between assignments and their relationship to student's perceptions.

According to Wood's typology, the assignments reflect the 'products' dimension of task type. A different measure of the type of task was used due to the ambiguous conceptualization of type of assignments. For example, a group exam is clearly interdependent, but a group case may have been split apart and done individually, or

done as a group in class. It is not clear on some assignments whether they were interdependent or independent in nature. Assignments alone were not a complete measure of type of task, but descriptive statistics and discriminant analysis do reflect some interesting facts about current teaching practices and use of groups. A summary of descriptive statistics involving type of assignment is given in Table I.1 and Table I.2 below.

Table I.1

Frequency of Task Types according to Survey Type

Survey:	LEAST		MOST	
Type of group Task	Total # completed	Test Statistic	Total # completed	Test Statistic
Exam	77	$\mu=0.183333$	109	$\mu=0.271144$
Presentation	96	$\mu=0.228571$	77	$\mu=0.191542$
Research Project	168	$\mu=0.400000$	165	$\mu=0.410448$
Written Paper	101	$\mu=0.240476$	85	$\mu=0.211443$
Case Study	217	$\mu=0.516667$	210	$\mu=0.522388$

Table I.2

Correlation Table for Task Types

Correlation Coefficients/ Level of Significance					
Exam	1.0000				
	$p=0.0$				
Presentation	-.08663	1.0000			
	$p=0.0130$	$p=0.0$			
Research	-0.0080	0.29129	1.0000		
Project	$p=0.8189$	$p=0.0001$	$p=0.0$		
Written Paper	-0.06315	0.34845	0.45804	1.0000	
	$p=0.0704$	$p=0.0001$	$p=0.0001$	$p=0.0$	
Case Study	-0.14327	0.05455	0.01001	0.05458	1.0000
	$p=0.0001$	$p=0.1181$	$p=0.7744$	$p=0.1179$	$p=0.0$

Appendix J: Analysis of Assumptions for Null Hypothesis Two

Table J.1

T-Test Analysis: Task Type and Member Performance

Task Type	N	Mean	Prob > T
Independent	1243	0.495977	
Interdependent	658	0.479483	0.2645

Appendix K: Frequency tables of task capability when member was rated as "best overall" and "worst overall"

BEST MEMBER							
	Commun- ication	Knowledge	Creativity	Technical	Inter- personality	Depend- ability	Total
Least/Indp	58	67	39	45	35	60	304
Least/Inter	13	15	11	9	12	17	77
Most/Indp	48	55	35	37	32	50	257
Most/Inter	28	40	13	19	16	32	148
Total	147	177	98	110	95	159	786

WORST MEMBER							
	Commun- ication	Knowledge	Creativity	Technical	Inter- personality	Depend- ability	Total
Least/Indp	90	98	78	76	79	107	528
Least/Inter	29	38	24	34	24	40	189
Most/Indp	60	62	46	59	54	65	346
Most/Inter	38	44	38	35	35	49	239
Total	217	242	186	204	192	261	1302