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The Effectiveness of Cooperative Learning Teams Using the BcubeTM Process

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Andrews University

School of Education

THE EFFECTIVENESS OF COOPERATIVE LEARNING TEAMS USING THE Bcube™ PROCESS

A Dissertation

Presented in Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

C. Vincent Anderson

June 2001

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THE EFFECTIVENESS OF COOPERATIVE LEARNING TEAMS USING THE Bcube™ PROCESS

A dissertation
presented in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

by

C. Vincent Anderson

APPROVAL BY THE COMMITTEE:

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Karen Graham

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July 23, 2001
Date approved

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ABSTRACT

THE EFFECTIVENESS OF COOPERATIVE LEARNING TEAMS USING THE Bcube™ PROCESS

by

C. Vincent Anderson

Chair: Elsie P. Jackson

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ABSTRACT OF GRADUATE STUDENT RESEARCH

Dissertation

Andrews University

School of Education

Title: THE EFFECTIVENESS OF COOPERATIVE LEARNING TEAMS USING THE Bcube™ PROCESS

Name of researcher: C. Vincent Anderson

Name and degree of faculty chair: Elsie P. Jackson, Ph.D.

Date completed: June 2001

Problem

Cooperative learning is attempted by placing students in group learning situations in which they receive assignments without a structured group or team-formation process. This study evaluated the effectiveness of the Bcube™ process with college students as a method of bringing together individuals of varied backgrounds to form cooperative-learning teams. In addition, the affect of the Bcube™ process on a particular learning outcome was also examined.

Method

Sixty-three Andrews University students (undergraduate and graduate) were divided into treatment and control groups. After a pretest was administered, the

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treatment group was given the Bcube™ process which is a method of team formation that can be used to support cooperative learning strategies. Then all groups were given a learning task followed by a posttest. The *Group Styles Inventory* and the *Group Development Questionnaire* collected information from the 11 groups.

Three-way analysis of covariance, three-way analysis of variance, *t* tests, Mann-Whitney, and Kruskal-Wallace tests were used to analyze the influence of the Bcube™ process along with gender and ethnicity on the five treatment groups.

Results

The control group scored higher than the treatment group on the posttest of the learning module. The treatment group perceived themselves more effective than the control group. The treatment group used a higher level of constructive group styles than the control group. The treatment group was observed displaying more traits of an effective group.

Conclusions

The control group used a centralized communication pattern to outperform the treatment group on the learning module. This supports previous research findings that simple task completion uses individual or centralized communication patterns whereas complex tasks lend themselves to a decentralized pattern.

The treatment group perceived that their group worked together effectively to generate better solutions than they could individually, solutions that they could "buy into." This suggests that the Bcube™ preparation favorably impacted the treatment group's self-perception.

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The treatment group's perceived higher level use of constructive group styles suggests that the Bcube™ emphasis on practicing cooperative strategies to accomplish taskwork had a significant affect. The observers' ratings and qualitative data concurred that the Bcube™ process is an effective classroom cooperative preparation strategy.

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DEDICATION

To my mom, Thelma L. Anderson, my wife, Dr. Joyce J. Anderson, and one of my brothers, Dr. David A. Anderson. Your love, support, faith, confidence, and inspiration gave me the push to get this done.

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ACKNOWLEDGMENTS

I have been extremely blessed throughout my life with people who assisted me in a variety of ways. I wish to pay homage to just a few who helped during the pursuit of this degree.

To my wife, Dr. Joyce J. Anderson, who encouraged me to leave the road most traveled. She showed by modeling how it could be done but allowed me to do it my way. Her continual support and encouragement made it possible for the dream to come true.

To my mother, Thelma L. Anderson, whose weekly phone calls always included encouragement to complete what I had started. She looked forward to proudly attending my graduation. Unfortunately, I didn't get my work done before she passed away.

To my brother, Dr. David A. Anderson, who has been a help all along. However, since my mother's passing he has stepped up his coaching role. I couldn't have asked for a better coach.

To my kids, especially Maija and Joylin, who have allowed me to participate as well as observe the development of their kids.

To my "Cousins Choir" of Francella Thomas and Yvonne Livsey for their unfailing belief that I really could do this.

To Robert D. Johnson for allowing us to study his brainchild.

To the folks at Human Synergistics, especially Kathy Wallace and Dr. Cheryl Boglarsky, for their instruction and guidance in the use of the *Group Styles Inventory*.

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To Dr. Susan Wheelan for introducing me to the Group Development Questionnaire, for sharing her work in group studies, and her encouragement and excellent training program.

To Dr. Susan Shott for helping clear away some of the clouds around this project.

To all of my research participants for taking the time to go through the process.

To my dissertation committee whose patience is to be admired, and whose instruction and guidance should be emulated.

To all of my editors and typists without whom there would be no document.

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CHAPTER I

INTRODUCTION

> We now live in a world increasingly characterized by interdependence, pluralism, conflict and rapid change. Instead of being a member of a discrete society, we live in a multi boundary world characterized by a diversity of worldwide systems in which all people affect and are affected by others. . . . We are created, not for isolation, but for relationships. . . . We are not born instinctively knowing how to interact effectively with others. The relationships so essential for living productive and happy lives are learned. (Johnson & Johnson, 1989, p. 5)

Diversity is now highly desirable in many organizations as well as academic settings. Those organizations with workforce and customer diversity are seeking to maximize the potential of this asset. Team building, cultural diversity, team learning, and cooperative learning are all efforts which seek to bring people of varying backgrounds together for the accomplishment of a common goal. I believe that an individual's and/or group's productivity as well as learning is enhanced by people working cooperatively in teams. Johnson, Maruyama, Johnson, Nelson, and Skon (1981) pointed out that people operating in a cooperative style attain higher achievement levels than those who function under competitive and individualistic learning structures. These results have been found to be true across age, subject matter, or task/functions. Other findings in cooperative-learning research include improved ethnic relations among students (Johnson et al., 1981), more positive social development and social relations

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among students at all grade levels (Slavin, 1983), significant gains in self-esteem when compared to traditional interaction (Slavin, 1983), more internal "in sense of control" (Kagan, 1994), and increased cognitive and effective role-taking abilities (Kagan, 1994).

According to Dewey (1933) and Gagne (1985), the learning style of teams in the workplace appears to be similar to those of cooperative learning groups in the classroom. Even though adults bring more and varied experiences, the learning processes are similar. Adults in the workplace deal with incorporating new information in the same way children do in the classroom. This is important in matching classroom learning with the content required or expected of individuals in the workplace. Therefore, methods used to enhance skills and thinking in individuals from different backgrounds should be usable interchangeably in the classroom or work environment.

Robert D. Johnson (1998) developed a series of cooperative activities designed to record how well group members learn from each other. He posits that in a "play" environment, inhibitions are lowered; actions and attitudes surface that impede the process from group assembly to team formation. In this "play" environment, these impediments can be discussed and dealt with in a nonthreatening way. When handled properly in "play" mode, the changes transfer to the "task" mode. Johnson has entitled this "play" mode the "Bcube™ process." The characteristics developed in those who participate in this process should be similar to those characteristics identified in literature as being present in effective cooperative learning groups.

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Statement of the Problem

It is my belief that there is at present an increasingly widespread view in Western society that individualism and competition are no longer in vogue and cooperative behaviors are needed to create a lasting, stable, and productive society. Many attempts are now being made to change the individualistic, competitive society that we have been acculturated in to a more diverse and cooperative society. The classroom is one arena where this transition is being attempted. Cooperative learning has been demonstrated to be an effective, motivational strategy across all grades and subject areas.

Cooperative learning is attempted by placing students in group learning situations in which they receive assignments without a structured group or team-formation process. Research indicates that less learning occurs in this type of group-learning situation than in a situation where the group has first become a team (Kagan, 1994). In addition, because these group members do not see themselves as a team, the teacher often experiences complaints from students about other students who do not contribute their "fair share" to the assigned task. Even though punitive measures, such as deduction of assignment points, are incorporated by the teacher in the class grading structure, little change occurs. Thus, finding the motivating factor for helping each member of the learning group to perform to his/her maximum potential becomes an important component to the learning process.

Purpose

The purpose of this study is: (1) to evaluate the effectiveness of three Bcube sessions with groups of college students as a method of bringing together individuals of

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varied backgrounds to form cooperative learning groups and (2) to evaluate the effectiveness of Bcube on posttest scores of a treatment group and a control group after both groups participated in a learning experience.

Theoretical Framework

The Bcube process is purported to be a method of team formation that perhaps can be used to support cooperative learning strategies. The Bcube process was developed by Robert Johnson (1998) of Interactive Communication Systems and is conceptualized as a learning environment using all five senses. It is operationalized as a group pre-operation game with facilitator feedback on group processes that prepares people from diverse backgrounds to work together as cooperative teams to carry out cooperative learning tasks.

"Bcube process" is Johnson's shorthand for "the Basic Building Box" which is designed to provide an experiential process for exploring and understanding the principles of systems thinking and team dynamics as described in detail by Peter Senge in his book *The Fifth Discipline* (1990). The activities included in the Bcube process are designed to help participants develop a greater appreciation for the value that diverse perspectives bring to the decision-making process.

In a learning organization, people see themselves as part of a whole system where there are interrelationships and processes that depend on each other. Senge (1990) lists five core disciplines necessary in building the learning organization: personal mastery, mental models, team learning, shared vision, and systems thinking. The Bcube process is

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based on three of the constructs of learning-organization theory: mental models, team learning, and shared vision. Figure 1 highlights the three areas of Senge's theory that are a part of the Bcube process.

Personal mastery has three components: First, an individual must have a goal. Second, the individual must have a true measure of how close he or she is to that goal. The gap between where one is and where one wants to be is referred to by Senge (1990) as a creative tension. Creativity results when one is unsatisfied with the current situation and is driven to change it. Third, the individual has a clear concept of current reality and sees the constraints that are present. Individuals who practice personal mastery become systems thinkers who see the interconnectedness of everything around them and, as a result, feel more connected to the whole. (See Fig. 1.)

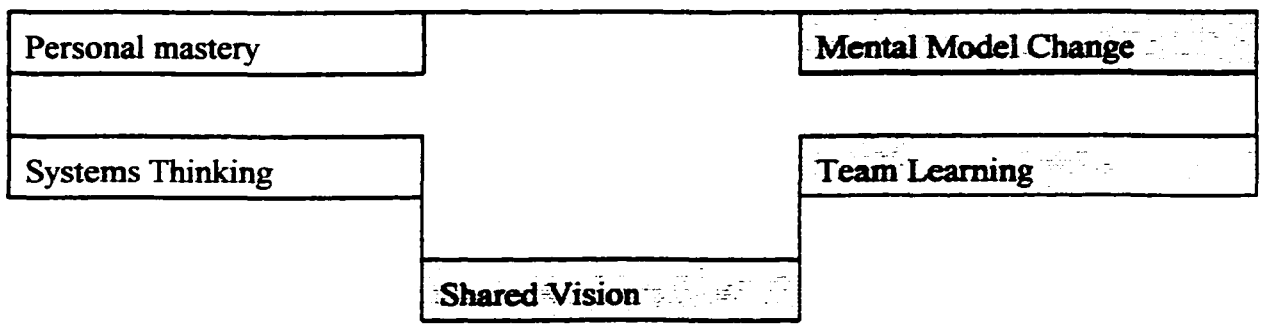

Figure 1. Learning organization theory components.

Mental models are a cognitive-psychology construct popularized by Phil Johnson-Laird in 1973 with origins in the 1940s by Kenneth Craik. Senge incorporated this

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construct in his learning-organization theory of organizational psychology in the early 1990s. A mental model is an individual's way of looking at the world. The way we see the world affects our experience of the world. A mental model determines how one thinks and acts. Several assumptions about mental models are:

1. Everyone has mental models.
2. Mental models determine how and what we see.
3. Mental models guide how we think and act.
4. Mental models are always incomplete.
5. Mental models lead us to treat our inferences as facts.
6. Mental models influence the results we get, thus reinforcing themselves.
7. Mental models outlive their usefulness.
8. Mental models are not static but are able to be changed.
9. Mental models are formed from interactions with our environments.

Team learning is the process of aligning and developing the capacity of a team to create the results members truly desire. This capacity to think together is gained by mastering the practice of dialogue and discussion. It builds on the discipline of shared vision and personal mastery (Senge, 1990). The indicators of team learning include suspending assumptions, acting as colleagues, and surfacing defensive routines.

Shared vision of a learning organization must be built on the individual visions of its members through interaction with each other. This requires not just dialogue and discussion but the acceptance of elements of each group member's input. It also requires

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acceptance of the group's shared vision as one's own or, at least, equal to or better than one's individual vision. The vision created is a common direction and is shared by its participants.

Systems thinking is a paradigm premised on the primacy of the whole. Once the behavior of a system is understood to be a function of the structure and relationships between the elements of the system, the system can be modified to produce changes that result in desired behaviors.

The Bcube process provides an opportunity to practice three of these learning organization skills in a non-threatening environment. Realization of the existence of mental models, the use of discussion and debriefing, and the attempts to produce group perceptions of unseen objects are all a part of this process. The outcome of the experience is the surfacing of the cognizance that an individual possesses a certain mental model of reality that has gaps. These gaps show up as people compare their attempts to assemble the segmented pieces of perceptions into a whole. This is analogous to having a puzzle with missing pieces.

An organization's or team's survival hinges on the ability of the employees or team members to improve on currently held mental models, or at least to make them more robust in response to changes in their environment (Barr, Stempert, & Huff, 1992). Lack of awareness of the gaps and distortions in our mental pictures has a tendency to make us resist change.

Being unaware of the existence of these mental pictures or models of reality in our minds means that we are often unaware of what is driving our behavior (Spooner,

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1996). Unexamined mental models are unchanged mental models that can create misconceptions that further distort our picture of reality (Barr et al., 1992; Perkins & Simmons, 1988; Senge, 1990).

Mental-model theory (Johnson-Laird, 1983; Senge, 1990) suggests that a separate picture or perception of reality is held by each individual. Those perceptions are formed by experience with the internal and external environment of the individual. Because the environment and, consequently, the experiences of that environment change over time, mental models are not static but change over time and with experience.

The Bcube process brings people together to provide a common, shared experience in which group members become aware that they have mental models, that there are distortions in their mental models as a result of gaps, and that others have mental models that may differ from their own. A facilitator's analysis of the experience assists the group in processing the interactions to become aware of their mental models, gaps, and, ultimately, their distorted perceptions of reality.

The Bcube process is comparable to a football team on a practice field. The players on a football team come together with their own individual skills (mental models). They practice with others on the team to become aware of these skills (mental models) to determine the weaknesses or limitations in their own skills (distortions). The coach (facilitator), through feedback, assists the players in becoming aware of individual skills (mental models), individual weaknesses (distortions), and the strengths of others (gaps). The practice allows the team to make use of the collective strengths (bringing

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together gaps to decrease distortions) and to develop new skills (group mental models) so that the team can play to win games (cooperative or group tasks).

Through interaction with others in a Bcube group situation, the awareness of individual distortions and gaps emerges along with a group (or shared) mental model (of a perceived reality). The common experience of group members provided by the Bcube process and the feedback facilitates cooperative team building, setting the stage for the cooperative team to be involved in effective cooperative learning.

Significance

The United States and other capitalistic societies have socialized a population for individualism and competition. This method of interaction is no longer viable in schools or in the economic environment of modern society. The United States and, indeed, the world through the use of technology and travel is becoming "one" place with many diverse groups. Efforts worldwide are being made to increase the communication process in culturally diverse groups. Schools and colleges represent only one area where the Bcube process has potential to have impact if it is used to increase communication between diverse personalities and thereby form effective learning and work teams. In the college setting, Johnson, Johnson, and Smith (1998) have identified several outcomes that are achieved from cooperative-based learning groups:

1. academic achievement
2. positive relationships with other students
3. psychological health

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4. social support for efforts to achieve academically

5. social support for personal well-being

6. less attrition and dropping out of college

7. more positive attitudes toward achievement and college

8. pro-social sense of meaning and purpose in one's life.

If the Bcube process can be demonstrated to be an effective method for team formation, it will be useful in classrooms and in many disciplines and domains to achieve many of the outcomes identified with cooperative learning groups. If the skills mastered using the Bcube process in a learning environment can be transferred to the workplace, businesses can benefit economically by saving money that is now being spent to provide this kind of training on site.

Research has demonstrated that time spent in team building enhances the cohesiveness, longevity, and productivity of a group (Johnson, Johnson, & Smith, 2000). This time is often viewed as time away from task in academia and time lost to productivity in the business world. Hopefully, this research demonstrates that time spent in team formation in the classroom, as well as the training room, would be made up by the increased effectiveness of the groups formed. The Bcube process shows promise of being an effective tool in bringing together heterogeneous groups. The type and amount of learning produced by properly formed student groups could be greatly enhanced.

This study adds to the scarce body of knowledge on effective tools to enhance cooperative learning by providing a pre-orientation stage in team formation, a deficiency

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recognized by the experts as currently existing.

Research Questions

The questions investigated in this study are divided into four groups: learning, group effectiveness, group styles, and stages of group development.

Learning Group

1. Will students who participate as a group in the Bcube module demonstrate increased learning of a given subject over those students who do not with respect to scores on a posttest?

Group Effectiveness

2. Will the group-effectiveness ratings of students who participate as a group in the Bcube module be higher than those of students who do not?

Group Styles

3. Will the methods of group interaction of students who participate as a group in the Bcube module be significantly different from those of students who do not?

Stages of Group Development

4. Will the observed group effectiveness rankings and the stages of group development ratings be significantly different for students who participate as a group in the Bcube module from those who do not?

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Research Hypotheses

The research hypotheses investigated in this study follow the same categories as the research questions.

Learning Group Hypothesis

1. Students who participate as a group in the Bcube module demonstrate increased learning of a given subject over those students who do not.

Group Effectiveness Hypothesis

2. The group-effectiveness ratings of students who participate as a group in the Bcube module are higher than those of students who do not.

Group Styles Hypothesis

3. The methods of group interaction of students who participate as a group in the Bcube module are different from those of students who do not.

Stages of Group Development Hypothesis

4. The observed group effectiveness rankings and the stages of group development ratings are different for students who participate as a group in the Bcube module from those who do not.

Definition of Terms

Terms used in this study are defined as follows:

Aggressive/Defensive group styles: Four of 12 group-interaction types developed

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by Cooke and Lafferty (1988) that indicate the tendency for members to treat the group as a means for achieving their own goals, thereby creating marginal-quality solutions limited by the level of expertise among members who gain control, limited commitment to the group and solution by individual members, and an impersonal tension-ridden group process. The names of the four indicator scales are Oppositional, Power, Competitive, and Perfectionistic.

Bcube module: An interaction experience of a team of people from varied backgrounds that increases the awareness of the existence of mental models, gaps, and distortions. It provides opportunities for shared experiences that lead to the formation of group mental models with the goal of team or cooperative-task performance. It provides a safe environment for the practice of the skills of a learning organization.

Constructive group styles: Four of 12 group interaction types developed by Cooke and Lafferty (1988) that indicate the group's concern for getting the job done (task skills) and for satisfying the needs of individual members (people skills). Constructive styles tap the full potential of group members and produce effective solutions. The names of the four indicator scales are Achievement, Self-Actualizing, Humanistic-Encouraging, and Affiliative.

Cooperative learning: Learning that occurs as a result of being a member of a cooperative-learning team.

Cooperative learning team: People who are together as a result of a structured, team-building process with an identifiable shared vision of an intended learning goal or outcome.

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Cooperative task: Assigned duties completed by cooperative teams consisting of more than one person.

Distortions: Mental models that are significantly out of alignment with reality.

Gaps: The blind spots or the unknowns in a person's mental model.

Group: People who come together for various reasons without a formal bonding structure.

Group cohesion: Resultant of all the forces that act on group members to remain in the group.

Group learning: Learning that occurs as a result of being a member of a group.

Feedback: The return of information about the result of a process or activity.

Mental model: A person's perceived reality; one's way of looking at the world.

Passive/Defensive group styles: Four of 12 group interaction types developed by Cooke and Lafferty (1988) that indicate the group's tendency for individual members to become dominated by the group as a whole, creating less-than-optimal solutions and a lack of constructive differing, creative thinking, and individual initiative. The names of the four indicator scales are Approval, Conventional, Dependent, and Avoidance.

Shared learning: The pooling of knowledge and examining of that knowledge from different angles.

Shared vision: A vivid mental image that evolves from the visions of all the people in the organization and that has great importance to each of them. It can be described also as a long-term, organizational goal that its people have enrolled in making a reality.

Systems thinking: Thinking that emphasizes looking at the "bigger picture." It is

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a thinking style that is aware of the factors of interconnectedness and interrelatedness and seeks to understand how a change to one part of the system will affect all of the other parts.

Team: People who are together as a result of a structured, team-building process with an identifiable shared vision of an intended goal or outcome.

Team building: The process of creating courteous behaviors, assisting with the development of decentralized communication patterns, assisting towards development of consensus decision making, developing a high level of enjoyment and satisfaction in team members, and assisting with developing the ability to generate group solutions superior to independent solutions.

Team learning: The realization and utilization of each team member's mental model in the formation of a team mental model, and consequently, the shared vision of the team.

Delimitations

This study uses a convenience sample of college students (graduate and undergraduate) at Andrews University in Berrien Springs, Michigan. Generalizability is limited to undergraduate and graduate students described by the population used for this study.

Organization of the Paper

This document is organized into five chapters. Chapter 1 provides the introduction, statement of the problem, purpose of the study, theoretical framework,

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significance of the study, the research questions, hypotheses, the definition of terms, and the delimitations of the study.

The literature review in chapter 2 covers group formation theory and techniques and the effect of games and simulations on learning.

Chapter 3 describes the methodology and type of research to be conducted. Included in this description are sample selection techniques, variables of interest, research techniques, instruments used, data collection, and statistical procedures used for analysis.

Chapter 4 presents the demographics of the sample used for this study, the independent observations by the researchers of the group, the results of the ANOVA and ANCOVA analyses administered to test the study's hypotheses, the results of the Mann-Whitney and the Kruskal-Wallis tests for nonparametric data, and the results of the *Group Development Questionnaire* used to assess the groups' level of functioning.

Chapter 5 reviews the purpose of the study, examines the relevant literature, reviews the theoretical framework, critiques the methodology, discusses the findings as they relate to the research questions asked, compares the findings of this study with the current body of literature, discusses the conclusions and their implications, and makes recommendations for further research.

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CHAPTER II

LITERATURE REVIEW

Introduction

The Bcube process is operationalized as a group, pre-orientation game with facilitator feedback on group processes that prepares individuals from diverse backgrounds to work together as cooperative teams to perform cooperative tasks. This literature review was undertaken with the idea of reviewing literature related to the operationalized view of the Bcube process. The broad areas starting my search for the research included cooperative learning, management games and simulations, and group dynamics. As each of these areas have large bodies of existing research, I limited my review to these three areas, eliminating other related bodies of research.

I begin this review with the history of cooperative learning. This literature review also briefly summarizes the findings of recognized experts in cooperative learning related to characteristics present in cooperative-learning groups. The theories of group formation and group development, games or simulations, and their use in group formation were reviewed as well as three specific areas found in group-formation literature that impact formation of effective groups: debriefing, communication patterns, and group cohesion.

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This chapter is divided into six sections. The first section traces some of the highlights of the history of cooperative learning; then summarizes the research on cooperative learning. The second section deals with the theories of group formation and group development. It also looks at the preparation strategies of the people participating in groups. The third section covers the history and research on the use of games and simulations in groups. The fourth section reviews the history and value of debriefing. The importance of communication patterns in group formation are outlined in the fifth section. It also describes two types of communication patterns that have been identified as used in groups. The sixth section summarizes the relationship between group cohesion and group productivity.

The History and Extent of Cooperative Learning Research

The Bcube experience as described by R. D. Johnson (1998) can be considered a preparation or modeling of cooperative group work. Therefore, a search of the history, and research of cooperative learning is relevant.

According to the Cooperative Learning Center at the University of Minnesota (2000), cooperative learning is at least as old as the Talmud, which clearly states that in order to learn you must have a learning partner. The Roman philosopher Seneca is quoted as stating, *Qui Docet Discet* (when you teach, you learn twice). Near the end of the Middle Ages, Johann Amos Comenius (1592-1679) noted that students benefitted both by teaching and by being taught by other students.

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In England, Joseph Lancaster and Andrew Bell developed and used in the late 1700s a type of cooperative-learning group technique that came to be known as Lancastrian schools. America imported this concept when a Lancastrian school was opened in New York City in 1806. The Common School Movement in the United States in the early 1800s emphasized cooperative learning. In the last three decades of the 19th century, Colonel Francis Parker acquired fame and success on his power to create a classroom atmosphere that was truly cooperative and democratic. Parker's advocacy of cooperation among students dominated American education through the turn of the century.

In 1900, John Dewey proposed in his *The School and Society* and tested at his Laboratory school the use of cooperative-learning groups as part of his famous project method in instruction (Hothersall, 1995). In the late 1930s, however, interpersonal competition began to be emphasized in schools and, in the late 1960s, individualistic learning began to be used extensively. In the 1980s, schools once again began to use cooperative learning (Johnson & Johnson, 2000).

Johnson et al. (1998) report that, since 1898, approximately 550 treatment and 100 correlational studies have been conducted on various facets of cooperation, competition, and individualistic efforts. However, most of these studies have been conducted in elementary schools; very few studies have been done at the secondary and college levels. Colleges and universities are implementing cooperative learning and testing its effects.

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Cooperative learning has been shown to have a positive impact on academic performance across all race and gender lines (Cohen & Lotan, 1997; Sharan, 1994; Slavin, 1995a, 1995b), but it also has been shown to have a positive impact on the social climate of the classroom (Slavin, 1995b; Stevens & Slavin, 1995). Allport asserts in his book *The Nature of Prejudice* (1954) that when students of diverse backgrounds have the opportunity to work and get to know one another on equal footing, they become friends and find it more difficult to hold prejudices against one another (Slavin, 1991, 1995b). However Slavin has found that in many schools, cross-ethnic interaction between students is superficial and competitive (Slavin, 1995b). The limited contact between students of diverse backgrounds fosters harsh stereotypes, and racial tensions persist (Crain, Mahard, & Narot, 1982; Oakes & Wells, 1995).

Cooperative-learning groups encourage positive social interaction between diverse groups, build cross-ethnic friendships, and reduce racial stereotyping, discrimination, and prejudice allowing students to judge each other on merits rather than stereotypes (McLemore & Romo, 1998). Slavin and Cooper (1999) indicate that cooperative-learning strategies, when applied properly by trained teachers, work most of the time. However, they have found instances where some students were bothered by the social conflicts that arose during group activities (e.g., "kids don't always listen to each other and get along"). The social skills and cooperative behaviors necessary for helping others in the group, listening to others, and "getting along" take time to develop. But according to Slavin and Cooper, that is one of the reasons for using cooperative learning: to develop those social skills.

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There are five basic components of effective cooperative learning (Johnson et al., 1998). They are (1) positive interdependence, (2) face-to-face promotive interaction, (3) individual and group accountability, (4) appropriate use of social skills, and (5) group processing. Positive interdependence is the belief that the group sinks or swims together; that if anyone succeeds, everyone must succeed. A commitment to others' success as well as to one's own is the result of positive interdependence.

Promotive interaction involves sharing resources and help, teaching one's knowledge to group members, and providing personal support to at least one other group member. The preferred way to do this, according to the authors, is face to face.

Accountability in cooperative learning exists at two levels: group and individual. The group is responsible for achieving its goal or completing its task. The group is aware of its overall progress as well as the individual contributions of its members. The individual members are responsible for contributing their assigned fair share of the task or goal. Each member's performance is measured to determine who needs additional help or encouragement.

Some of the social skills used in effective cooperative groups include leadership, decision-making, trust-building, communication, and conflict management. Some or all of these social skills may need to be taught in tandem with the academic subject area.

Group processing according to Johnson et al. (1998) is the evaluation part that is occurring with the academic learning. Groups need to look at what is working and what is not working, as well as who is working. Group effectiveness can improve only if continual analysis is made of how members are working together.

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Even though R. D. Johnson (1998) does not mention "cooperative learning," by his description, the Bcube experience is a face-to-face strategy that teaches some of the requisite skills of cooperative-learning. This research looks at how effective Bcube is as a social skills teaching strategy. It also looks at differences in the group effectiveness of the Bcube treatment groups.

Although acts of intolerance and racism, in most cases, are more subtle today than they were 20 years ago (Vernay, 1990), a resurgence of overt racism and violence seems to be occurring on school campuses. If schools are to serve as a safe haven from violence and a place for students to learn how to be good citizens, the use of instructional strategies such as cooperative learning needs to be more widespread (Slavin & Cooper, 1999).

Theories of Group Formation

The history of group studies began in the 1950s with Bales's (1950) system to code interaction patterns in small groups. After that beginning, group studies for the next three decades were one of two types. One type consisted of the "impressionistic" studies that relied primarily on experiences and the reflections of observers (e.g., Bennis & Shepard, 1956; Bion, 1961; Caple, 1978; Rogers, 1970; Slater, 1966). The other type consisted of the "empirical" studies using observational systems (e.g., Babad & Amir, 1978; Bales, 1950; Dunphy, 1964; Hill, 1974; Mills, 1964).

Within these two types of studies, group practitioners generated and tested a variety of theories. The theories can be categorized in three broad groups: succession of phases theory, cyclic theory, and regression/recycling theory. The "succession " or

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"phase" theory is the most widely held theory in the literature. It espouses that groups move through a number (ranging from 2 to 5) of phases and take on a different character or concern in each phase. The most supported number is four phases.

The most well-known of these phased theories is by Tuckman. B. W. Tuckman (1965) developed a "phased" theory of group development that incorporated both the interpersonal relationships of group members and task completion. In its simplest form, it is know as "Forming, Storming, Norming, and Performing." Tuckman's theory is built around the premise that "any group, regardless of setting, must address itself to the successful completion of a task" (Seers & Woodruff, 1997, p. 129). He then set about looking at how group members relate to each other while completing the task.

Seers and Woodruff (1997) state, "Tuckman's analysis of the interpersonal issues of member dependence, intimacy, control, cohesiveness, conflicts, and the emergence of roles and norms was relatively elaborate" (p. 171). Tuckman's model was intended to be used for a wide variety of groups. His theory stands despite criticisms and alternate theories and models that have been posited in the 36 years since its inception. However, Seeger (1983) was able to clarify that the phased movement from stage to stage usually applied only to problem-solving groups with members who had not previously met. When group members have prior shared experience, the kinds of stages suggested by Tuckman should not be expected (Seers & Woodruff, 1997). This may be important given the limited population of 3,000 Andrews University students from which my sample was drawn.

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Using more accepted scientific terminology, the four stages are named by Wheelan (1994a) as Dependency/flight, Counter-dependency/fight, Pairing/counter-pairing, Work. The following descriptions of the four stages are taken from Wheelan and Tilin's (1997) summary of Wheelan's earlier detailed descriptions in 1990 and 1994.

Stages of Group Development

Stage 1: Dependency and inclusion. A major characteristic of this first stage of group development is the significant amount of member dependency on the designated leader. At the same time, members initiate attempts to get to know each other and to determine what the rules, roles, and structures of this group will be.

Stage 2: Counter-dependency and fight. This stage is characterized by conflict among members and between members and leaders. It also includes flight from task and continued attempts at tension avoidance.

Stage 3: Trust and structure. Assuming that the conflict stage in navigated successfully, members of the group will feel more secure with, and trusting of, each other and the leader. Now the group can begin a more mature negotiation process about group goals, organizational structure, procedures, roles, and division of labor.

Stage 4: Work. Once goals, structure, and norms are established, the group can work more effectively. To work, people must be able to communicate freely about ideas and information.

Wheelan's description mentions a fifth group. I am including Wheelan's description of that stage as it seems to add a sense of closure.

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Stage 5: Termination. Most temporary groups have an ending point. Even in continuous groups, however, various endings result: tasks are completed and members retire or leave. At each ending point, functional groups tend to evaluate their work together, to give feedback, and to express feelings about each other and the group (Lundgren & Knight, 1978).

The cyclic and regression theories have much less support in the literature and are briefly described here. The cyclic models reject the notion that the groups smoothly evolve through stages, however many there are. They emphasize the long-lasting absorption of groups with the same issues and imply that the resolution of certain issues is only temporary (Wheelan & Tilin, 1997).

The regression models posit that groups are both successive and cyclic. A good example of this theory might be what happens when a new member is added to a group. The group could drop back from the fourth phase known as the "work phase" into the third phase where issues of trust, roles, and/or group structure are revisited. Or the group could drop back, regress to, or recycle to the issues of power, authority, and competition between members of the group that are found in the second phase.

In summary, although many theories of group formation have evolved over the past four decades, contemporary group theorists view most of these theories as having the same components. Currently, the literature in group development supports the four- or five-phase theory for new group formations with options for the group recycling or regressing to former stages as the group's situation changes. However, more research is needed to determine the relationship between the stages of group development and group

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members' perceptions of productivity. The Bcube process is tested against the phase theory to see if it has any effect on moving the treatment group into or out of any of the four phases.

Simulations in Groups

The Bcube experience, as explained in this report, could be viewed as a collection of games and simulations, and therefore have its value and effect discounted. In anticipation of this judgment, a part of this search was dedicated to reviewing the historical use and value of this genre with a specific interest in the use of games as a pre-orientation strategy for group formation.

The search of literature turned up little in the way of research in the area of using games or simulation for the express purpose of aiding group formation or preparing people to participate in groups. However, much descriptive literature exists on games and simulations used with anecdotal evidence of the benefits to learning by these types of activities.

An increase in the amount of literature on the use of games starts in the late 1950s due to the rise of computer technology, education research with games, operations research, and the continuing growth and sophistication of war games (Keys & Wolfe, 1990).

This section of the literature review summarizes findings related to the effect of games on learning; the results of facilitator feedback during games; and the effectiveness of games in assisting with performing group tasks. Keys (1977, 1989) developed the

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"management of Learning Grid" that claims that effective learning in games requires the balance of three factors: (1) content–new ideas, concepts, or principles; (2) experience–the opportunity to apply content; (3) feedback–seeing the results of actions/decisions at each phase of the simulation.

Keys and Wolfe's (1990) review of the literature prior to 1990 points out that much of the research and the resultant claims for and against business games in particular rests on "anecdotal material or inadequate or poorly implemented research designs" (p. 311). After eliminating all non-treatment research designs prior to 1966, Keys and Wolfe noted that both cases and games impart factual knowledge equally well, but the games were superior at teaching conceptual knowledge. Dill (1961) found no correlation between a group's average aptitude score and game performance. Dill's 1966 study used games to test homogenous groups based on GPA and aptitude scores. He found that high-ability teams outperformed low-ability teams.

Average team or group scores often mask the individual team-member's contribution. Wolfe (1978) created single-member teams that obtained correlations ranging from .351 to .503 between a student's GPA and game performance.

Several studies (Certo, 1976; Keys, 1977; McKenney, 1967; Wolfe, 1975) suggest that instructor guidance during the game and skilled debriefing after are key to providing learning and closure. DeBattista (1986) found that learning during games was greatest when there was periodic, structured feedback versus random feedback.

The literature indicates that a variety of categories of games and simulations (i.e., decision making, strategic planning) is generally effective (Keys and Wolfe, 1990).

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The face validity of business simulations is its strongest asset (Byrne, 1979; Glazer, Steckel, & Winer, 1987; Kinnear & Klammer, 1987; Lucas, 1979; Wolfe & Jackson, 1989).

Gaming increases interest, involvement, and enthusiasm (Lant, 1989; McGrath, 1982; Rowland & Gardner, 1973). Gaming also provides rapid, concrete, and consistent feedback which may be the most appropriate laboratory for testing dynamic models of decision making (Bass & Vaughn, 1966; Lant, 1989; Lant & Montgomery, 1987; Nees, 1983; Rowland & Gardner, 1973).

Two of the major drawbacks of gaming is its lack of generalizability (Lant, 1989; McGrath, 1982) and the increased cost of development and administration over the use of cases or simpler exercises (Keys & Wolfe, 1990).

In summary, although the literature is silent in the relationship of games to group formation, the effective use of games in many stages of group interaction suggests a use for games in the formation of groups. The practice-field aspect of the Bcube experience is a game with the specific intent of practicing or playing certain skills with the desired outcome being the emergence of a group mental model. Because the Bcube is currently being used in this manner, research designed to assess its effectiveness is timely.

Debriefing

Torres and Macedo (2000) point out that the concept and recognition of the benefits of having students experience an event and then reflect on it date back to Aristotle and was revived in the 20th century by Dewey. The process of reflection, as

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defined by Torres and Macedo, consists of returning to the experience which comprises recollecting the experience and replaying the events or recounting them to others.

The old concept of reflection is referred to in more recent literature as debriefing. Baker and Jensen (1997) maintain that debriefing as a part of the overall educational process is pivotal in transforming experience into learning. An effective debriefing session helps the player to reflect objectively on the learning experience and to gain new knowledge from this reflection. Torres and Macedo (2000) believe that debriefing is where most learning takes place. This belief parallels R. D. Johnson's (1998) claim that the practice field of the Bcube process, where debriefing takes place, is where an individual's mental model changes to a group mental model.

St. Germain and Leveualt (1997) suggest that the purpose of debriefing is to assist participants to share their feelings and opinions about the learning experience. Debriefing, therefore, ensures learning symmetry through the sharing process of the session. The game may be meaningless, but it is a good excuse to debrief (Thiagarajah, 1998).

Nadler (1979) suggested the need for attention on the effects of feedback on the performance of groups. Nadler, Comman, and Mirvis (1980) tested the effects of an ongoing feedback system on the performance of work crews in an industrial setting and found it to be effective when the feedback involved group goal setting and problem solving.

Wheelan (1994a) suggests that interventions that include goal setting, performance feedback, and attention to group-development issues are supported in

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literature to have the most impact on group productivity. Wheelan concluded that without feedback, groups find it very difficult to judge progress or make corrections to get back on course. Those groups that get feedback regularly will be the most successful.

Likewise, Guzzo, Jackson, and Katzell (1987) in a meta-analysis of 330 group-intervention studies found that interventions that included goal setting and feedback had the most positive effects on group productivity.

However, Balcazar, Hopkins, and Suarez (1986) in a meta-analysis of 36 studies reported mixed results for many of the studies on group feedback and productivity.

DeNisi, Randolph, and Blencoe (1982) suggest that the level and source of feedback may affect group performance. DeBattista (1986) found that learning was greater with regular, structured, and continual feedback .

From this, Jones, Buerkle, Hall, and Rupps (1993), using the productivity measurement and enhancement system (ProMES) of Pritchard and Roth (1988) with 225 employees of a small retail corporation, assessed the effect of feedback on performance of two groups. Using least-squares regression methods, these researchers found that feedback raised performance levels of the treatment group over the control group.

Likewise, Mesch, Farh, and Podsakoff (1994) studied the effect of sign on group goal setting, strategies, and performance using the control theory of Weldon and Weingart. One hundred seventy-seven undergraduate students were randomly assigned to two levels of group feedback sign (positive and negative) in which the groups' behavioral reactions to feedback were measured by their performance in a second

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session. Findings suggested that goal setting and feedback (with negative feedback having an implication for higher level group performance than positive feedback) play a critical role in determining group performance.

Also, Barr and Conlon (1994), using Fisbein and Azjun's theory of reasoned action, randomly assigned 180 undergraduate and graduate business students to 60 three-person groups or management teams comprised of all men or all women to study the effects of distribution of feedback in work groups. ANOVA findings suggested that group feedback has a positive effect on individual persistence intentions ($p<.001$). Findings also suggest that individual feedback will affect persistence intentions only when group feedback is positive ($p<.01$).

Pritchard, Jones, Roth, Stuebing, and Ekeberg (1988) in a time-series analysis under field-research conditions characterized by a small number of groups found that group productivity increased with feedback of productivity indicators. These researchers also found that goal setting positively affected productivity. These findings are consistent with the findings of Guzzo et al. (1987) of their meta-analysis of group intervention studies.

In summary, debriefing or reflection is valuable to the learning process. Some researchers feel that it is the most important part. Although a few researchers report mixed findings on the effect of feedback on increased productivity in groups, the majority of findings suggest that feedback does increase group productivity. The Bcube experience posits that the formation of group mental models occurs during the debriefing and feedback period.

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Communication Patterns in Groups

The basic elements of group culture and structure are learned as a result of interactions in many social situations and groups (Wheelan, 1994a). These are the mental models that one brings to participate in new situations.

"People can only form groups when they communicate or interact regularly with each other" (Nixon, 1979, cited in Wheelan, 1994a, p. 28). Communication is the most basic necessity in groups (Bavelas, 1950). To communicate, group members must share their beliefs, values, and attitudes with each other in order to establish balance and develop consistency in these areas. Thus communication is an essential process in group development. Communication patterns determine who may talk to whom and is the first part of the group's social structure to emerge (Wheelan, 1994a). The type of communication structure that is adopted has been found to affect group leadership (Kano, 1971), group morale (Lawson, 1965), problem-solving efficiency (Leavitt, 1951), and group cohesion (Schein, 1980).

The act of communicating, according to Wheelan (1994a), serves to aid discussion and at the same time begins to establish the structure of the status-leadership hierarchy from the very beginning of group formation. The act of communicating is a factor in group cohesiveness which has been demonstrated to influence group productivity (Hare, 1976). This status-leadership hierarchy may doom the group to failure but may also be effective for performance of group tasks.

The way people communicate in groups can also be related to one's physical placement in the communication network. Different kinds of communication networks

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have been studied based on placement in the communication network. From these studies, centralized and decentralized communication networks have been identified. Centralized networks are those that tend to funnel communication through a central person who solves the group problem and checks with another member to confirm the solution. In a circle--an example of a decentralized network--no one person is central and all the information goes to all members who solve the group problem independently. The results are checked with everyone. Research suggests that the person in the most central position in a network is most likely to be perceived as the leader (Cohen, 1962; Leavitt, 1951; Shaw, 1954).

When simple problems are asked to be solved, the centralized network has been demonstrated to be the most efficient and to produce the best results, but when complex problems were used, the circle or decentralized pattern was found to be most efficient (Bavelas, 1950; Brown & Miller, 2000; Cohen, 1962; Kano, 1971; Lawson, 1965; Leavitt, 1951).

Bavelas (1950) in analyzing a series of studies of small groups suggested that group productivity in low-complexity tasks is increased with the presence of centralized leadership. Hirokawa (1980) tested the hypothesis that differences exist between communication processes within effective and ineffective decision-making groups. Ninety-two undergraduate students were randomly assigned to four groups and asked to prepare a solution to the NASA, moon-survival problem. He found that the more effective groups spent more time on procedural matters and tended to interact until agreement was reached.

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Brown and Miller (2000) randomly assigned 48 college students to two groups to study communication networks in task-performing groups. Using factorial analysis to analyze data, the researchers found that communication was more centralized in groups that worked on low-complexity tasks than in groups that worked on high-complexity tasks, supporting findings of previous research by Bavelas (1950) and others.

Wheelan (1994a) sees these research findings as supporting group development advancing to the work stage when decentralized communication patterns are used, and inhibiting group development when centralized communication networks are used.

In summary, literature identifies communication as the necessary component for group formation. Decentralized communication patterns include input from all group members and are suggested to be a factor in increasing group cohesiveness, which is positively related to increased group productivity. Centralized communication patterns in which information is channeled to one or two persons inhibit group development. During the Bcube debriefing sessions, attempts are made to identify how the group is communicating and how it is affecting the group's ability to generate solutions. This literature supports the benefit of knowing how this can impact a group's performance.

Cohesion in Groups

Festinger (1950) defined group cohesion as the result of all the forces that act on group members to remain in the group. Wheelan (1994a) describes cohesion as the result of member attraction to the group, interpersonal attraction, group morale, group effectiveness, methods of conflict resolution, and the timing of leader feedback.

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Wheelan suggests that the more alike group members are, the more cohesive the group will be. Wyer (1966, cited in Wheelan, 1994a, p. 63) found that high levels of cohesion increase conformity in the group. Wheelan (1994a) suggests that in the initial stage of group formation, cohesion and conformity might be necessary for group survival and that groups at this stage are not in a position to solve complex problems. Yet, students, placed together in learning groups in classrooms, are expected to solve problems without the benefit of group-orientation strategies. In this situation, the group is forced into premature decision making. Wheelan suggests that the outcomes in such circumstances tend to be inferior since there is no time for development of a decentralized communication pattern.

Other positive effects of cohesion in groups include increased conformity (Wyer, 1966), increased group influence over members (Wheelan, 1994a), increased member satisfaction with the group (Schaible & Jacobs, 1975), and increased cooperation (Johnson & Johnson, 1994).

Cohesion increases cooperation, which has been demonstrated to increase effective communication, create friendlier group atmosphere, increase individual desire to work on group tasks, increase the division of labor in a group, produce greater coordination of labor, increase trust, and increase group productivity (Johnson & Johnson, 1994).

Janis (1982) suggests that cohesion increases groupthink, a concurrence-seeking tendency that leads to poor decision making in groups. Wheelan (1994a) suggests that

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similar caution with regard to cohesion is appropriate. Groups, due to an overriding wish to maintain cohesion, can make poor and dangerous decisions.

Carron, Widmeyer, and Brawley (1985) suggest a social and a task aspect of group cohesion. These researchers refer to the social aspect of cohesion as a general orientation to maintain social relationships with the group, whereas the task aspect of cohesion involves a general orientation toward achieving the group's goals and objectives.

Bernthal and Insko (1993) studied the role of task-oriented cohesion and its relationship to social-emotional cohesion and found that low social-emotional and high task-oriented cohesion resulted in the lowest perception of groupthink. Groups high in social-emotional cohesion were more likely to experience the symptoms of groupthink than were groups high in task-oriented cohesion.

McGrath (1984) found that groups with high levels of cohesion interact more than low-cohesion groups. Stodgill (1972) associates higher levels of cohesion and increased interaction with greater productivity. Sorrentino and Sheppard (1978) found that group members' actions can increase or decrease group effectiveness. Members who express liking for, respect for, and trust in others facilitate cohesion in groups. In contrast, group members who express anxiety, distrust, or defensiveness reduce group effectiveness.

In summary, literature suggests that group cohesion occurs over a period of time and is mediated by several factors. Group cohesion can have negative effects on groups through the process of groupthink and concurrence of the group to maintain cohesiveness that results in poor group decisions. Generally, the findings in literature support

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increased group cohesion as facilitating increased group productivity. The Bcube process is believed to increase cohesion in groups.

Literature Review Summary

Findings relevant to this study from the research are:

1. Researched strategies to bring groups together are needed.
2. Little is known about games as a strategy to prepare for bringing diverse people together to form groups.
3. Debriefing, decentralized communication patterns, and group cohesion increase group productivity and effectiveness.
4. Characteristics of effective cooperative-learning groups include:
    a. Positive interdependence
    b. Face-to-face promotive interaction
    c. Individual and group accountability
    d. Appropriate use of social skills
    e. Group processing.

The Bcube process purports to impact group formation in several areas. Many of these areas have been identified in literature as necessary for effective, cooperative-learning groups. Most important, the Bcube process purports to address the need identified in literature for strategies to bring people from diverse backgrounds together to form cooperative teams. Its current use is based on anecdotal reports. Research is needed to assess the veracity of those reports.

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CHAPTER III

METHODOLOGY

Introduction

This study used a pretest/treatment/posttest method with control and treatment groups pulled from a convenience sample. The groups were randomly generated according to the stratifiers of gender and ethnicity. An effort was made to balance the groups by gender and ethnicity as these are two of the three variables of interest in this study. Kagan (1994) suggests that cooperative-learning groups provide the best overall outcome when groups are heterogenous. The actual group sizes were limited to five to seven, as seven is the upper limit of a Bcube group. Table 1 shows how each group was treated and tested.

A mixed-model research design was used to incorporate quantitative and qualitative data collection and analysis as advocated by Turner and Meyer (2000). Both my research assistant and I made independent qualitative observations of 50% of the control and treatment groups using the Group-Development Questionnaire for structured observations that were then quantified for reporting purposes. Unstructured observations were also conducted and reported.

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Table 1

Research Map

Group	Learning Pre/Posttest	Receiving Bcube	Group Effectiveness Posttest	Group Styles Posttest	Group Ranked on Effectiveness
1	x	x	x	x	
2	x	x	x	x	
3	x		x	x	
4	x		x	x	
5	x		x	x	
6	x	x	x	x	x
7	x		x	x	x
8	x	x	x	x	x
9	x		x	x	x
10	x	x	x	x	x
11	x		x	x	x

Variables

The independent variable in this study is the Bcube process. Gender and ethnicity are treated as moderating variables. The dependent variables in this study are: (1) adjusted posttest scores; (2) mean scores of the groups' self-assessed, group-effectiveness rating as reported on the *Group Styles Inventory*; (3) scores on a self-assessed profile of 12 group traits; (4) mean scores of the *Group Development Questionnaire* on each group's levels of development; and (5) group-effectiveness ratings of each group as computed by the *Group Development Questionnaire.*

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Sample Description

Participants in this study were men and women, over the age of 18, who were students (graduate or undergraduate), spouses of students, or staff at Andrews University. Of the 63 participants, 39 were female and 24 were male. Ethnicity was diverse: 7 Asians, 3 Asian Pacific Islanders, 22 Blacks, 1 Filipino, 3 Hispanics, 1 "Multi-culti", 1 Native American, 1 Tongan, 20 Whites, and 4 who preferred not to respond. For the sake of analysis, ethnicity is reduced to three groups: Black, Other, and White.

Twenty-six of the participants were in the "under 20" age group. Another 29 participants were in the "20-29" age group. Four were in the "30-39" age group, 2 in the "40-49" age group, 1 in the "50-59" age group, and one who preferred not to respond.

Fifty-seven participants were undergraduate students, 2 had bachelor's degrees, 2 had some graduate work, and 2 had master's degrees. Among the undergraduates, 23 were freshmen, 9 sophomores, 13 juniors, and 12 were seniors.

There were 31 subjects in the treatment group and 32 in the control; 62% were female; 87% were age 29 and under; 91% were undergraduates; 35% were Black, 33% were in an arbitrary Other, and 32% were White.

Thirty-seven different majors were represented by the participants. Six participants were Nursing majors; another six were Religion/Theology majors. These groups had the highest concentrations. Counseling/Psychology followed with five. Two student worker/staff participated as well. A complete list of the sample's academic majors and other demographics is in Appendix B.

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A stratified random assignment to groups of five to seven individuals was used to balance groups by gender and ethnicity. This was accomplished by using a sign-in sheet as the basis for random selection, then assigning as needed to balance the groups.

Of the 63 participants divided into 11 groups, 29 said that they did not know "well" anyone else in the group; 18 knew one person "well," 5 participants knew two persons "well," 4 participants knew three persons "well," and 1 participant felt he knew "well" all the people in his group. Six participants chose not to respond to this question.

Instrumentation

Pre- and Posttests

The pre- and posttests were equivalent multiple-choice tests which focused on a module of respiratory pathophysiology. Each test contained 15 questions and was administered in 30 minutes. These knowledge tests were authored by a nursing instructor based on the learning objectives of the module. This subject matter was chosen to limit the effect of each participant's prior knowledge of the subject.

Group Styles Inventory

Measurement of the group's perceived effectiveness was determined using the effectiveness scale on the *Group Styles Inventory* developed by Cooke and Lafferty (1988). It is a seven-question survey using a 5-point Likert scale. The instrument asks "to what extent" the respondent feels the seven elements were present in the group. The responses range from "not at all" to "to a very great extent."

This instrument was selected because of the similarities of the categories of

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styles of effective and ineffective groups to those described by Johnson & Johnson (1994) as being present in effective, cooperative-learning groups (see Table 2).

The group profiles were compiled and displayed using the *Group Styles Inventory* Circumplex by Cooke and Lafferty (1993). The profiles are displayed in chapter 5 on pages 136 (Figure 3) and 137 (Figure 4). This inventory is a categorizing instrument that also indicates the extent of the trait categorized. "Certain group styles are positive and synergistic and lead to high quality solutions to which members are committed. Other styles, however, are counterproductive and self-defeating and lead to solutions of marginal quality and acceptance" (p. 4). The profile is divided into 12 styles. Four of the styles are in the "Aggressive/Defensive" cluster, 4 are in the "Passive/Defensive" cluster, and 4 of the styles are in the "Constructive" cluster.

The group styles that produce the most effective solutions and use the full potential of all the members of the group are in the "Constructive" cluster. The "Aggressive/Defensive" styles produce marginal quality solutions due to the power and control strategies used by group members. The "Passive/Defensive" labeled groups are prone to accept less than optimal solutions due to the high-level need for approval and acceptance.

Each of the 12 styles has 6 questions (72 in all) that are rated from a low of (0) "not at all" to a high of (4)"to a very great extent." From *Group Styles Inventory* by R. A. Cooke and J.C. Lafferty, 1983, 1986, 1987, 1989, Plymouth, MI: Human Synergistics. Copyright 1989 by Human Synergistics, Inc. Adapted by permission.

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Table 2

Comparison Between Effective and Ineffective Groups

Effective Groups	Ineffective Groups
Goals are clarified.	Members accept imposed goals.
Communication is open with accurate expression of ideas and feelings.	Communication is 1-way, only ideas are expressed; feelings are ignored.
Participation and leadership are distributed among group members; goal accomplishment and change are underscored.	Leadership is delegated and based upon authority; participation is unequal; high-authority members dominating; emphasis is goal accomplishment.
Ability and information determine influence and power; individual goals negotiated; power is shared.	Position determines influence and power is concentrated in authority positions; obedience to authority is the rule.
Controversy and conflict are seen as positive.	Controversy and conflict are ignored, denied, avoided, or suppressed.
Interpersonal and group behaviors are stressed: cohesion advanced by use of inclusion, affection, acceptance, support. Individuality is endorsed.	The functions performed by members are emphasized; cohesion is ignored and members are controlled by force. Rigid conformity is promoted.
Problem-solving adequacy is high.	Problem-solving adequacy is low.
Members evaluate the effectiveness of the group and decide how to improve its functioning; goal accomplishment, internal maintenance, and development are all considered important.	The highest authority evaluates the group's effectiveness and decides how goal accomplishment may be improved; stability is affirmed.
Interpersonal effectiveness, self-actualization and innovation are encouraged.	Organizational persons who desire order, stability, and structure are encouraged.

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The internal-consistency reliability of the 12 scales was estimated through the use of Cronbach's alpha. Interrater reliability was assessed using analysis of variance (ANOVA) with group membership as the independent variable and the 12 scales scores as dependent variables.

The Constructive styles (Achievement, Self-Actualizing, Humanistic-Encouraging, and Affiliative) demonstrate acceptable levels of internal consistency with alpha coefficients ranging from .68 to .80.

The *F*-statistics in Table 3 show that the variance in responses to the *Group Styles Inventory* (GSI) measures is significantly greater between groups than within groups. "The relatively high level of agreement between members within groups along all 12 GSI styles lends support to the assertion that a group, rather than an individual, level construct is measured by the inventory" (Cooke & Szumal, 1992, p. 8). The *F*-statistics for the Constructive styles range from 2.02 to 3.13.

Cooke and Szumal measured validity by using a survival simulation and deriving criterion-related zero-order correlations between the 12 GSI scale scores and the quality and acceptance measures on the back of the GSI instrument. I show only the acceptance measures as they are generalizable whereas the quality measures are specific to the chosen simulation. (See Table 4.)

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Table 3

Internal Consistency and Interrater Reliability of the 12 Group Styles

Group Styles	alpha	*F*
Humanistic-Encouraging	.79	2.71**
Affiliative	.80	2.82**
Approval	.62	1.58*
Conventional	.61	1.76*
Dependent	.60	1.60*
Avoidance	.55	1.68*
Oppositional	.61	3.74**
Power	.79	2.88**
Competitive	.82	3.77**
Perfectionistic	.72	3.99**
Achievement	.76	3.13**
Self-Actualizing	.68	2.02**

Note. n = 311. Adapted from *Validity of the Group Styles Inventory with Respect to Solution Quality and Acceptance Criteria*, by R. A. Cooke and J. L. Szumal, 1992. Copyright 1992 by Department of Management, University of Illinois at Chicago.
*$p<.01$. **$p<.001$.

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Table 4

Relationship Between Group Styles and Effectiveness Criteria Measure of Criterion-related Validity

Group Styles	Commitment to Solution	Group Consensus
Humanistic-Encouraging	.60***	.74***
Affiliative	.35**	.64***
Approval	-.45***	-.53***
Conventional	-.58***	-.64***
Dependent	-.35**	-.55***
Avoidance	-.37**	-.50***
Oppositional	-.35**	-.53***
Power	-.34**	-.50***
Competitive	-.35**	-.55***
Perfectionistic	-.45***	-.65***
Achievement	.55***	.72***
Self-Actualizing	.43***	.55***

Note. From *Validity of the Group Styles Inventory with Respect to Solution Quality and Acceptance Criteria*, by R. A. Cooke and J. L. Szumal, 1992, copyright 1992 by Department of Management, University of Illinois at Chicago, Chicago, Illinois.

**p<.01 ***p<.001

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Group Development Questionnaire

I needed an organized method for collecting and analyzing qualitative data on the groups in the research project as one method in a triangulated approach for this study. I decided to use the *Group Development Questionnaire* or GDQ (Wheelan & Hochberger, 1996) as a guide for structured observation and assessment of selected control and treatment groups. This allowed for a quality check on how the two observers rated the groups observed and gave me a sense of the issues in each group as well as an approximation of the observed group's stage of perceived development.

The GDQ was developed to provide a quick, inexpensive way to help group members understand their group's dynamics and to work to facilitate group effectiveness and productivity as opposed to the traditional, group-observational research methods that are difficult and slow. The traditional research method generally requires the videotaping and audiotaping of the group work sessions, transcribing the tapes verbatim, classifying each group member's statements, and then submitting these data to analysis. This process can take hundreds of hours for just a few group sessions (Wheelan, 1994b).

The GDQ measures group functioning. It is intended to assist and support groups in their efforts to be nurturing environments for their members and productive vehicles for the achievement of shared goals. This is sufficiently close to the intent of the Bcube experience to make it a valid metric of the concept.

Even though the GDQ provides a profile of current group functioning, it is not designed to ferret out all the possible reasons for that profile. In fact, identical GDQ results can have different implications for groups depending on the length of time the

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groups have been functioning, the context in which the groups are operating, and the task or size differences among the groups.

The GDQ has evolved over a number of years. It has been reviewed, tested in several ways for reliability, and tested in several other ways for validity. Wheelan started by reviewing the literature on group development and in 1994 generated a list of characteristics that identify groups at various stages of development. Using these characteristics, Wheelan developed several forms of the questionnaire and tested them with various groups until the most effective version was identified. This final questionnaire was submitted to a panel of seven experts on group development. After incorporating their comments, the GDQ was tested for reliability and validity. The results of those tests are shown below.

A Pearson product-moment correlation was obtained for each scale of the GDQ to determine the test-retest reliability of the instrument. See Table 5. The correlations range from a high of .89 for scale II to a low of .69 for scale III. These correlations are acceptably high.

The internal consistency of the GDQ was established for each scale using Cronbach's alpha. The results are displayed in Table 6 which shows that internal consistency is high as alpha coefficients II, III, and IV are in the high range.

Wheelan (1994b) reports the concurrent validity, the predictive validity, the construct validity, and the criterion-related validity for the GDQ. The GDQ was compared to the Group Attitude Scale (GAS) (Evans & Jarvis, 1986). The GAS is a

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Table 5

Test-Retest Correlations for the GDQ Scales

Scale	*r*	*p*
GDQ I	.74	.000
GDQ II	.89	.000
GDQ III	.69	.000
GDQ IV	.82	.000

Note. $N = 45$.

Table 6

Internal Consistency Analyses of GDQ Scales

Scale	Mean	Scale *SD*	Item *SD*	Alpha
GDQ I	44.51	5.94	1.08	.69
GDQ II	43.85	9.67	1.06	.88
GDQ III	51.31	6.87	1.00	.74
GDQ IV	54.73	8.89	.98	.88

Note. $N = 164$.

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20-item instrument that measures member attraction to the group. It has been found reliable and valid and has some correlations with group development. Table 7 shows the results of the comparison.

Table 7

Concurrent Validity of the GDQ and GAS Scales

Index	*r*	*p*
GDQ I	.18	*ns*
GDQ II	.55	.01
GDQ III	.67	.001
GDQ IV	.59	.006
Total GDQ	.48	.03

Note. $N = 20$.

The results show that the concurrent validity of the GDQ and the GAS to be in the moderate range for the overall score and all the scales except GDQ I. Wheelan explains that the GDQ I scale measures dependency and inclusion issues as opposed to member cohesion and would not be expected to have a high correlation to the GAS.

The purpose for using this instrument was to guide the data collection of qualitative information. Accordingly, the questions on the instrument were pared back to only those that the two observers agreed could be answered based on observable behavior. This changes the instrument enough so the metrics for norms and quartile ranges cannot be used. It does allow for the highlighting of noted issues occurring within

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the individual groups and their stages of development.

The GDQ has four scales, one for each of the first four stages of development discussed above. Each scale is made up of 15 items. Scale I measures the amount of energy a group is expending on issues of dependency and inclusion. "Energy" is defined for each scale as the group's use of time and intellectual resources. Scale II measures the amount of energy a group is expending on issues of conflict and counterdependency. Scale III measures the amount of energy expended by a group on issues of trust and structure. Scale IV measures the level of group effectiveness and the amount of work being accomplished by the group.

According to Wheelan (1994b), "on each scale, the higher the scores, the more involved a group is with the issues measured by that scale. Thus, low scores on scale I and II and high scores on scales III and IV would indicate a more effective group than the reverse" (p. 3:19).

Combining the group's performance on the four scales comprises a group profile. The scores on each scale are totaled and percentages calculated of that total for each scale. Wheelan (1994b) reports that this yields a unique profile for each group that allows for initial categorization and subscale comparison and analysis. In addition, the potential perfect score on scale IV is divided into the group's actual score on scale IV to calculate the group's effectiveness ratio (ER). The items that make up the GDQ scale IV reflect research findings with regard to effective, work-oriented groups. So the ER provides a way to estimate the observer's perceptions of a group's effectiveness.

After the paring mentioned earlier, scales I and III had 10 items each, scale II had

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11 items, and scale IV had 8 items. The scale-I items used for the observer ratings were #1, #5, #9, #13, #17, #21, #25, #29, #33, and #37. The scale-II items used for the observer ratings were #2, #6, #10, #14, #18, #22, #26, #30, #38, #54, and #58. The scale-III items used for the observer ratings were #3, #7, #11, #15, #19, #23, #27, #35, #43, and #59. The scale-IV items used for the observer ratings were #4, #8, #12, #20, #24, #28, #36, and #56.

Procedure

The recruitment of participants included an announcement in the electronic edition of the campus newsletter, bulletin-board announcements in the School of Business, and letters to all faculty in the Educational and Counseling Psychology department asking them to promote participation in the study (8 letters). A personal visit was made to the Department of Behavioral Sciences to meet with the professor teaching the undergraduate statistics class to request that he announce the study in his class. Flyers announcing the study and asking for participation were delivered to the men's and women's residence hall deans for distribution by the Resident Assistants to the dormitory residents. In addition, students in the undergraduate Developmental Psychology class were given extra credit if they participated. Copies of the announcements and letters are in Appendix D. Sixty-six students responded. Three declined after telephone contact or before the study started.

Clearly, this is a sample of convenience. Generalizations to the Andrews University student population or any other population should be made with caution.

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Informed Consent

Written consent was obtained from each participant prior to the beginning of the research. Each participant was briefed on the broad intent of the study before being asked to sign the consent form. It was explained that the level of danger to participants would be minimal as the cooperative-learning task was primarily cognitive and the group-skills evaluations would be confidential. All participants were promised they would be debriefed at the end of their sessions. A copy of the informed consent form is included in Appendix C. Participants were given an ink pen with the researcher's address and phone number printed on it. They were told to use the information if they wanted a copy of the results.

The students were assigned randomly to the treatment (31) and control groups (32). A pretest consisting of 15 questions was used to assess prior knowledge of the content material presented in the learning module. No students were eliminated due to prior knowledge as the ANCOVA analysis accounted for the prior knowledge.

The task assigned to each group was to learn to interpret blood-gas readings. This simple task required memorizing four facts and being able to recognize the possible 16 patterns resulting from the various combinations of these facts. Reading and interpreting blood-gas levels is a task with specific steps that is taught to laboratory technicians and respiratory therapists as well as to physicians. This task was chosen to limit the effect of prior knowledge and its similarity to learning activities in classrooms combining procedural and declarative-knowledge strategies. According to Marzano and Pickering (1997), learning procedural knowledge begins with constructing mental models of the

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steps involved in the process or procedure. The first step in learning declarative knowledge is constructing meaning for facts. Both were needed for the successful completion of the task assigned during this research project.

Treatment Group

After the pretest, the students assigned to the treatment group spent approximately 60 minutes participating in the Bcube process. The learning module was given to the treatment group with the instruction to study the material together as a group in preparation for a test. The treatment group was given 20 minutes to study the material in the learning module. The group activities were observed by me and/or my research assistant to collect qualitative documentation for comparison to and verification of the dependent variables.

The Bcube process consists of introducing the concept of mental models, how they are formed, how they affect one's perceptions of reality, their limiting and enhancing features, and how they are changed. This is followed by three exercises that allow the participants to interact and experience in a play setting how their mental models are working.

The first exercise was a paper-and-pencil assignment that required the group to develop a strategy for getting a task done. Its intent was to show how group members' mental models of the task limited their selection of options to solve the problem. The second exercise involved an interaction box where seven items were placed. The participants could not see the items but could feel them inside the box. Each interaction

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box has seven "workstations" to accommodate participants. The participant at one end of the interaction box had all of the items at the beginning of the exercise. She was given 15 seconds to examine the object inside the box and record what it was. It was then passed to the next participant workstation and another item was examined for 15 seconds. All of the items were passed to all of the participants in 15-second increments. Each participant made his or her own record of what the items were. The instructions to the participants were that the record could be a written description or a drawing. These individual records were each person's reality of what was in the box, his or her individual mental models. The groups were then given 10 minutes to share their mental models and develop a shared-group mental model for each item. Each group posted its shared mental models and presented how they came to that conclusion. After all of the presentations, the interaction boxes were opened to reveal what was actually inside. The groups were allowed time to "celebrate" their successes and discuss how they missed an item. The overall treatment group was then debriefed on the accuracy of the individual mental models versus the shared-group mental models. Usually, the group model is more accurate if the group is not dysfunctional. The observed dysfunctions and the expressed feelings of each group member were discussed in terms of how they limit or enhance the group mental model.

The third exercise also used the interaction box. It required the group participants to assemble a structure inside the box. Each participant had a separate piece or more of the structure and participated in the construction of the structure. During the debriefing of this exercise, the amount and type of participation were discussed to

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emphasize the need for indirect participation (cheering) as well as direct participation (playing). The structure consisted of seven pieces but extra pieces were added. This added to the complexity of the interactions.

Control Group

The control group was instructed to introduce themselves to each other using the "name and where you are from" format. They were given the learning module and instructions that they were to study together as a group to master the material. They were instructed that there would be a test at the end of the session.

The group's activities were observed by me and/or my research assistant to collect qualitative documentation for comparison and verification of self-reports of group effectiveness and functional type. This is consistent with literature suggestions that when self-report instruments are used to collect data, some type of observer input should be used when possible.

Posttest

At the end of the 20 minutes allowed for both groups to master the material, 20 minutes was allowed for the posttest. This was followed by the self-report *Group Styles Inventory* and the Group-Effectiveness rating. No time limit was set for this instrument. After all of the instruments had been completed, coded with the last four digits of the participants' social security numbers, and collected, both groups were debriefed on the overall nature of the research project. Each group was told whether they were a control or treatment group and that the research was trying to determine differences between the

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two groups in learning, attitude, group styles utilized, and rate of development. The participants were paid $10 cash for their time, thanked, and dismissed. The control group members took 2 hours, on average, to finish while the treatment group took 3 hours to finish.

To decrease the threats to internal validity (diffusion, contamination, and hostile response) on the research project, the control group met on the first floor of Bell Hall while the treatment group met on the ground floor. This was important since the Bcube treatment lengthened the time the treatment group was in session. The Bcube process creates an atmosphere that could have spilled over and distracted the control group if the meetings were held too closely together.

Confidentiality

The confidentiality of the participants' responses on all the instruments used in the research project is being maintained by using the last four digits of each participant's social security number and the first alpha character in their last name on each instrument.

Statement of Null Hypotheses

The 4 research hypotheses stated in chapter 1 lead to 27 null hypotheses. These are divided into four categories: learning, group effectiveness, group styles, and stages of group development.

Learning

Hypothesis 1: There is no significant difference between the posttest mean scores

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of the treatment and control groups.

Hypothesis 2: There is no significant difference between the posttest mean scores of male and female students.

Hypotheses 3: There is no significant difference between the posttest mean scores of students of various ethnic groups.

Hypothesis 4: There is no significant interaction between treatment group and gender with respect to posttest mean scores.

Hypothesis 5: There is no significant interaction between treatment group and ethnic group with respect to posttest mean scores.

Hypothesis 6: There is no significant interaction between gender and ethnicity with respect to posttest mean scores.

Hypothesis 7: There is no significant three-way interaction among the three factors.

Hypotheses 1 to 7 were tested by three-way analysis of covariance (ANCOVA) with posttest scores as criterion and pretest scores as covariate. The mean score of each hypothesis above relates to the adjusted posttest mean.

Group Effectiveness

Hypotheses 8 to 14 parallel hypotheses 1 to 7 except that the dependent variable is "group effectiveness."

Hypothesis 8: There is no significant difference between the mean scores on the Group-Effectiveness scale as measured by the *Group Styles Inventory* of the treatment

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and control groups.

Hypothesis 9: There is no significant difference between the mean scores on the Group-Effectiveness scale on the *Group Styles Inventory* of females and males.

Hypothesis 10: There is no significant difference between the mean scores on the Group-Effectiveness scale on the *Group Styles Inventory* of the various ethnic groups.

Hypothesis 11: There is no significant interaction between treatment group and gender with respect to the mean scores on the Group-Effectiveness scale on the *Group Styles Inventory.*

Hypothesis 12: There is no significant interaction between treatment group and ethnic group with respect to the mean scores on the Group-Effectiveness scale on the *Group Styles Inventory.*

Hypothesis 13: There is no significant interaction between gender and ethnic group with respect to the mean scores on the Group-Effectiveness scale on the *Group Styles Inventory.*

Hypothesis 14: There is no significant three-way interaction among the three factors.

Group Styles

The next 12 hypotheses were tested by *t* test.

Hypothesis 15: There is no significant difference between the mean scores on the Humanistic-Encouraging scale on the *Group Styles Inventory* of the treatment and control groups.

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Hypothesis 16: There is no significant difference between the mean scores on the Affiliative scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 17: There is no significant difference between the mean scores on the Approval scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 18: There is no significant difference between the mean scores on the Conventional scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 19: There is no significant difference between the mean scores on the Dependent scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 20: There is no significant difference between the mean scores on the Avoidance scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 21: There is no significant difference between the mean scores on the Oppositional scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 22: There is no significant difference between the mean scores on the Power scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 23: There is no significant difference between the mean scores on the Competitive scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 24: There is no significant difference between the mean scores on the Perfectionistic scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 25: There is no significant difference between the mean scores on the Achievement scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 26: There is no significant difference between the mean scores on the Self-Actualizing scale on the *Group Styles Inventory* of the treatment and control groups.

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Stage of Group Development

Hypothesis 27: There are no observed differences in the stage of group-development ratings between students who participate as a group in the Bcube module and those who do not.

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CHAPTER IV

RESULTS

This chapter presents the demographics of the sample used for this study, the independent observations by the researchers of the group, the results of the ANCOVA, ANOVA, and *t* tests analyses administered to test the study's 27 null hypotheses, the results of the Mann-Whitney and the Kruskal-Wallis tests for nonparametric data, and the results of the *Group Development Questionnaire.*

Sample Description

Participants in this study were men and women over age 18 who were students (graduate or undergraduate), spouses, or staff at Andrews University. Of the 63 participants, 39 were female and 24 were male. Table 8 presents gender percentages.

Table 8

Sample Gender Breakdown

Category	Frequency	%
Female	39	61.9
Male	24	38.1
Total	63	100.0

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Ethnicity was diverse with seven Asians, three Asian Pacific Islanders, 22 Blacks, one Filipino, three Hispanics, one "Multi-culti," one Native American, one Tonganese, 20 Whites, and four who preferred not to respond.

Ethnicity was reduced to three groups as shown in Table 9 to accommodate the preference of ANOVAs to have equal sized groups. This resulted in Blacks and Whites remaining as separate groups while all the other ethnic groups were placed in a general "Other" category for comparison purposes.

Data from the Student Services Office of Andrews University shows the general ethnic breakdown of the student body is 45% White, 30% Black, 15% Asian, and 10% Hispanic. In this sample of the student population, Whites and Hispanics are underrepresented and Blacks and Asians are overrepresented.

Table 9

Ethnicity of Sample

Category	**Frequency**	**%**
Black	22	34.9
White	20	31.7
Other	21	33.3
Total	63	99.9

Fifty-five participants (87%) in the sample were under 30 years of age. Twenty-six of the participants were in the "under 20" group. Another 29 participants were in the "20 - 29" age group. Four were in the "30 - 39" age group, two in the "40 - 49" age

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group, one in the "50 - 59" age group, and one who preferred not to respond to this question. Table 10 presents the percentages of each group.

Fifty-seven (91%) of the participants were undergraduate students, two had bachelor's degrees, two had some graduate work, and two had master's degrees (9% graduates). Among the undergraduates, 23 (40%) were freshmen, nine (16%) sophomores, 13 (23%) juniors, and 12 (21%) seniors. Table 11 presents the results in tabular form.

Thirty-seven different majors were represented by the participants. Nursing majors with six participants and Religion/Theology with six participants had the highest concentrations. Counseling/Psychology followed with five. Two were student worker/staff who participated as well. A complete list of the sample's academic majors and other demographics is in Appendix B.

Table 10

Sample Age Ranges

Category	Frequency	%
Under 20	26	41.3
20 - 29	29	46.0
30 - 39	4	6.3
40 - 49	2	3.2
50 - 59	1	1.6
No response	1	1.6
Total	63	100.0

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Table 11

Sample Educational Levels

Categories	Frequency	%
Freshman	23	36.5
Sophomore	9	14.3
Junior	13	20.6
Senior	12	19.0
Bachelor's degree	2	3.2
Some graduate work	2	3.2
Master's degree	2	3.2
Total	63	100.0

A stratified random assignment to groups of five to seven individuals was used to balance groups by gender and ethnicity. Of the 63 participants divided into 11 groups, 29 said that they did not know "well" anyone else in the group; 18 knew "well" one person in the group; 5 participants knew "well" two persons in their group; 4 participants knew "well" three persons in their group; and 1 participant felt that he knew "well" all the people in his group. Six participants chose not to respond to this question.

Independent Observations

The design of this research is a mixed-model type incorporating quantitative and qualitative data collection and analysis as advocated by Turner and Meyer (2000). This section reports the findings of the unstructured, independent observations of the

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treatment and control groups. The *Group Development Questionnaire* section reports findings of the structured independent observations.

The research assistant and I recorded observations of control and treatment groups made during the study sessions, the posttest, and completion of the GSI as recorded below. Both of us observed each group independently.

The setting for all the sessions was 6:30 p.m. on a Monday or Thursday in a traditional classroom for the control group and a classroom set up for cooperative activities for the treatment group. The lighting was adequate; the noise level seemed appropriate for the study as no other adjacent classes were in session at that time in that wing of Bell Hall. The motivation levels appeared high in both the control and treatment groups. However, a few participants in both groups seemed to manifest a level of disinterest in the study sessions. By contrast, those who knew each other prior to the research session and were placed in the same group seemed to have the most trouble staying on task.

Control Group

An attempt was made to mimic the conditions of the traditional classroom using standard tables and chairs in rows. After the participants were divided into groups and given their assignment, individual study predominated. Although members of most groups gathered around a single oblong table, the preferred physical arrangement was not to face each other. Little eye contact appeared between control-group members. The physical distance between the participants was greater than that of the participants in the

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treatment group. One or two persons dominated the leadership of each group.

Each participant was given an ink pen with my address and telephone number printed on it so they could contact me with questions or request a copy of the study. During the pretest, there were a few moments when some participants clicked their pens nervously. However, during the posttest, the increase in the number of individuals clicking the pens, the frequency, and the volume of the pen clicking became quite noticeable to me and the participants.

Members of the control groups took longer to complete the *Group Styles Inventory* than did treatment-group members.

In most control groups, a leader emerged early, and in all cases where a leader could be identified, the leader was male with no one ethnic group dominating leadership. No one challenged the authority of the leader. If the leader identified a strategy for learning, control-group members seemed to accept it without discussion.

Members of the control groups asked more questions of the instructor than members of the treatment groups. There appeared to be more reliance on the instructor for advice than on other group members in the control groups.

Fewer attempts were made to bring the nonparticipants into the discussion but many one-on-one interactions did occur between control-group members.

Those who perceived that they were in the control group were curious as to what the treatment group was doing that was different. To accommodate this curiosity, two control groups were allowed to participate in two of the Bcube exercises during the debriefing session.

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Treatment Group

The groups sat around six-sided tables facing each other. Frequent outbursts of laughter and a general attitude of friendliness pervaded. Eye contact between group members and leadership was shared. In only one of the treatment groups did an obvious leader emerge, a White female. In all of the other treatment groups, leadership was shared. A majority of treatment-group members were talking and contributing. There was discussion of alternative strategies to learning the material, but no disagreements. Group members seemed to be more willing to rely on other group members for answers to questions rather than asking questions of the instructor. No anxiety appeared among treatment-group members. The treatment groups constructed lists naming or describing items examined inside the Bcube process. The lists that were generated by the groups were more accurate than any individual member list.

Treatment-group members appeared to take a longer time to complete the posttest than control-group members, but all posttest were turned in on time. Participation came from a majority of those in the treatment group. Three of the treatment groups asked to take the posttest as a group. This request was granted after they had taken the individual posttest. The group test results were not used in this study.

Hypothesis Testing

This section presents the results of each hypothesis tested. The hypotheses were grouped into four categories: Learning, Group Effectiveness, Group Styles, and Stage of Group Development. The Learning category consists of seven hypotheses (hypotheses 1a

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to 1g) that were tested by three-way analysis of covariance (ANCOVA). The adjusted posttest means generated by the three-way ANCOVA vary in Table 12 from those generated by the two-way ANCOVAs in Tables 14 and 16 due to regression differences.

Learning: Hypothesis 1

Hypothesis1a. There is no significant difference between the adjusted posttest means of the treatment and control groups.

Hypothesis 1b. There is no significant difference between the adjusted posttest means of male and female participants.

Hypothesis 1c. There is no significant difference between the adjusted posttest means of participants of various ethnic groups.

Hypothesis 1d. There is no significant interaction between treatment group and gender with respect to the adjusted posttest means.

Hypothesis 1e. There is no significant interaction between treatment group and ethnicity with respect to the adjusted posttest means.

Hypothesis 1f. There is no significant interaction between gender and ethnicity with respect to the adjusted posttest means.

Hypothesis 1g. There is no significant three-way interaction among the three factors: treatment group, ethnicity, and gender.

These hypotheses were tested by three-way analysis of covariance, with the posttest as criterion and the pretest as covariate. Table 12 gives the means related to this analysis, and Table 13 shows the results of the ANCOVA.

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Table 12

Means for Three-way ANCOVA of Learning Hypothesis 1

Ethnic	Gender	*N*	Pretest Mean	Std. Dev.	Posttest Mean	Std. Dev.	Adjusted Postest Mean
Control Group							
Black	Female	7	1.1429	1.2150	12.2857	3.4503	12.425
	Male	1	0.0000	.	15.0000	.	15.768
	Total	8	1.0000	1.1952	12.6250	3.3354	14.097
White	Female	5	0.8000	0.8367	10.4000	5.4589	10.728
	Male	5	2.6000	1.6733	12.2000	4.6043	11.538
	Total	10	1.7000	1.5670	11.3000	4.8546	11.133
Other	Female	9	1.0000	2.1213	10.6667	5.8523	10.885
	Male	5	2.8000	2.1679	12.8000	3.8341	12.028
	Total	14	1.6429	2.2398	11.4286	5.1696	11.457
Total	Female	21	1.0000	1.5492	11.1429	4.8917	11.346
	Male	11	2.4545	1.9164	12.7273	3.8753	13.112
	Total	32	1.5000	1.7961	11.6875	4.5680	12.229
Treatment Group							
Black	Female	8	1.1250	1.6421	7.3750	5.1807	7.525
	Male	6	1.5000	2.0736	4.6667	5.5377	4.610
	Total	14	1.2857	1.7728	6.2143	5.3086	6.067
White	Female	7	0.8571	1.0690	12.4286	3.1547	12.725
	Male	3	2.0000	1.7321	9.3333	5.5076	9.002
	Total	10	1.2000	1.3166	11.5000	3.9511	10.863
Other	Female	3	0.6667	1.1547	15.0000	.	15.402

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Table 12 — *Continued.*

Ethnic	Gender	*N*	Pretest Mean	Std. Dev.	Posttest Mean	Std. Dev.	Adjusted Postest Mean
	Male	4	2.0000	2.4495	9.0000	5.4772	8.660
	Total	7	1.4286	1.9881	11.5714	5.0285	12.035
Total	Female	18	0.9444	1.3048	10.6111	4.9246	11.884
	Male	13	1.7692	1.9644	7.0769	5.5447	7.427
	Total	31	1.2903	1.6369	9.1290	5.4021	9.655
Combined Groups							
Black	Female	15	1.1333	1.4075	9.6667	4.9952	9.975
	Male	7	1.2857	1.9760	6.1429	6.3882	10.189
	Total	22	1.1818	1.5625	8.5455	5.5783	10.082
White	Female	12	0.8333	0.9374	11.5833	4.1661	11.727
	Male	8	2.3750	1.5980	11.1250	4.7940	10.270
	Total	20	1.4500	1.4318	11.4000	4.3091	10.998
Other	Female	12	0.9167	1.8809	11.7500	5.3619	13.143
	Male	9	2.4444	2.1858	11.1111	4.7551	10.348
	Total	21	1.5714	2.1112	11.4762	4.9962	11.746
Total	Female	39	0.9744	1.4233	10.8974	4.8493	11.615
	Male	24	2.0833	1.9318	9.6667	5.5534	10.269
	Total	63	1.3968	1.7090	10.4286	5.1202	10.942

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Table 13

Three-Way ANCOVA

Source	Type III Sum of Squares	*df*	Mean Square	*F*	*P* Values
Treatment	74.392	1	74.392	3.339	.074
Gender	19.233	1	19.233	.863	.357
Ethnic	18.788	2	9.394	.422	.658
Treatment* Gender	108.694	1	108.694	4.879	.032*
Treatment* Ethnic	141.408	2	70.704	3.174	.050*
Gender*Ethnic	15.050	2	7.525	.338	.715
Treatment* Gender *Ethnic	6.313	2	3.156	.142	.868
Error	1113.959	50	22.279		
Total	8477.000	63			

* Significant at 0.05 level.

Table 13 indicates two significant two-way interactions: Treatment*Gender ($F = 4.879$, $df = 1, 50$, $p = .032$); and Treatment*Ethnic ($F = 3.174$, $df = 2, 50$, $p = .050$). Therefore, the main effect hypotheses should not be studied at this point. However, null hypotheses 1g is retained.

Because the Gender x Ethnic interaction was not significant, the two-way ANCOVA, Gender x Ethnic, was studied at each treatment level.

Table 14 shows the means related to this analysis for the Control Group and Table 15 gives the results of the ANCOVA.

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Table 14

Descriptive Statistics for Gender x Ethnic for the Control Group

Gender	Ethnic	*N*	Pretest Mean	Std. Dev.	Posttest Mean	Std. Dev.	Adjusted Posttest
Female	Black	7	1.143	1.215	12.2857	3.450	12.604
	White	5	0.800	0.837	10.4000	5.459	11.025
	Other	9	1.000	2.121	10.6667	5.852	11.113
	Total	21	1.000	1.549	11.1429	4.892	11.581
Male	Black	1	0.000	.	15.0000	.	16.339
	White	5	2.600	1.673	12.2000	4.604	11.218
	Other	5	2.800	2.168	12.8000	3.834	11.640
	Total	11	2.455	1.916	12.7273	3.875	13.066
Total	Black	8	1.000	1.195	12.6250	3.335	14.472
	White	10	1.700	1.567	11.3000	4.855	11.121
	Other	14	1.643	2.240	11.4286	5.170	11.376
	Total	32	1.500	1.796	11.6875	4.568	12.323

Table 15

ANCOVA for Gender x Ethnic for the Control Group

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Pretest	61.868	1	61.868	2.831	.105
Gender	10.272	1	10.272	.470	.499
Ethnic	29.894	2	14.947	.684	.514
Gender *Ethnic	8.024	2	4.012	.184	.833
Error	546.361	25	21.854		
Total	5018.000	32			

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Table 15 indicates no significant interaction and no significant main effect. Therefore, the null hypotheses 1b, 1c, and 1f are retained for the control group.

Table 16 gives the related means for the treatment group, and Table 17 shows the ANCOVA results. Table 17 indicates no significant interaction while both main effects are significant. This indicates that there are significant gender ($F = 4.561$, $df = 1, 24$, $p = .043$) and ethnic ($F = 4.623$, $df = 2, 24$, $p = .020$) differences within the treatment group. Null hypotheses 1b and 1c are rejected for the treatment group and 1f is retained.

The adjusted posttest mean for females (11.679) is significantly higher than the adjusted posttest mean for males (7.563). That is, the treatment was significantly more effective for females than for males.

For the ethnic main effect, the Student-Newman-Keuls ($\alpha = 0.05$) and Scheffe ($\alpha = 0.10$) post-hoc tests were used. Table 18 shows both tests indicate two homogenous subsets of means that are significantly different. One subset includes White and Other ethnic groups; and the other subset includes only the Black ethnic group. The more conservative Scheffe test accounts for the unequal group sizes and is used at the 0.10 level as recommended by Scheffe (1959). Both tests indicate that the treatment effect was less for Blacks in the treatment group than for Whites and Other Ethnics in the treatment group.

Treatment was studied by five one-way ANCOVAs: (1) for males ($F = 6.992$, $df = 1, 21$, $p = .015$), (2) for females, (3) for Blacks ($F = 9.557$, $df = 1, 19$, $p = .006$), (4) for Whites, (5) for Other Ethnics. Table 19 shows the results of these analyses. Null hypothesis 1a is rejected for males and Blacks.

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Table 16

Descriptive Statistics for Gender x Ethnic for the Treatment Group

Gender	Ethnic	*N*	Pretest Mean	Std. Dev.	Posttest Mean	Std. Dev.	Adjusted Posttest
Female	Black	8	1.125	1.6421	7.3750	5.1807	7.406
	White	7	0.857	1.0690	12.4286	3.1547	12.511
	Other	3	0.667	1.1547	15.0000	.	15.119
	Total	18	0.944	1.3048	10.6111	4.9246	11.679
Male	Black	6	1.500	2.0736	4.6667	5.5377	4.627
	White	3	2.000	1.7321	9.3333	5.5076	9.198
	Other	4	2.000	2.4495	9.0000	5.4772	8.865
	Total	13	1.769	1.9644	7.0769	5.5447	7.563
Total	Black	14	1.286	1.7728	6.2143	5.3086	6.017
	White	10	1.200	1.3166	11.5000	3.9511	10.855
	Other	7	1.429	1.9881	11.5714	5.0285	11.992
	Total	31	1.290	1.6369	9.1290	5.4021	9.621

Table 17

ANCOVA for Gender x Ethnic for the Treatment Group

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Pretest	2.673	1	2.673	0.117	.735
Gender	104.311	1	104.311	4.561	.043*
Ethnic	211.456	2	105.728	4.623	.020*
Gender*Ethnic	14.222	2	7.111	0.311	.736
Error	548.917	24	22.872		
Total	3459.000	31			

*Significant at 0.05 level.

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Table 18

Treatment Group Post Hoc Tests

		N	Subset	
			1	2
Student-Newman-Keuls* **	Black	14	6.2143	
	White	10		11.5000
	Other	7		11.5714
	Sig.		1.000	.974
Scheffe* ***	Black	14	6.2143	
	White	10		11.5000
	Other	7		11.5714
	Sig.		1.000	.999

* The group sizes are unequal. The harmonic mean of the group sizes (9.545) is used. Type I error levels are not guaranteed.
** Significant at 0.05 level.
*** Significant at 0.10 level.

Table 19

Results of One-Way ANCOVAs

Subgroup	Adjusted Means for Treatment Group	Adjusted Means for Control Group	*df*	*F*	*p*
Males	07.563	13.066	1,21	6.992	0.015*
Females	11.679	11.581	1,36	0.100	0.754
Black	06.017	14.472	1,19	9.557	0.006*
White	10.855	11.121	1,17	0.003	0.954
Other	11.992	11.376	1,18	0.020	0.889

* Significant at 0.05 level.

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Summary of Hypothesis 1 Findings

Two significant interactions (treatment*gender and treatment*ethnicity) were found. As Table 20 shows, the control-group males scored higher than treatment males on the adjusted posttest means. No significant gender differences were revealed in the control group. However, significant gender differences did appear in the treatment group with females scoring higher than males. The Blacks in the treatment group benefitted least from the treatment, based on posttest mean scores. Blacks in the control group scored higher than Blacks in the treatment group. Blacks in the control group scored higher than any other ethnic group in the control or treatment groups.

Table 20

Summary of Findings for Hypothesis 1

Learning Hypotheses	Control Group	Treatment Group	Outcomes
1a	rejected	rejected	Control males higher than treatment males
1b	retained	rejected	Treatment females higher than treatment males
1c	retained	rejected	Blacks benefitted least from treatment
1d	rejected	rejected	Significant interaction
1e	rejected	rejected	Significant interaction
1f	retained	retained	No interaction
1g	retained	retained	No interaction

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Group Effectiveness: Hypotheses 2-8

The group effectiveness category has seven hypotheses numbered 2 - 8 (each with subhypotheses a through g) that were tested by ANOVA. For all hypotheses tests, alpha equals .05. The Mann-Whitney and Kruskal-Wallis tests were the nonparametric tests used. To accommodate ANOVA's preference for equal-sized groups, ethnicity was reduced to three groups: Black (22), Other (21), and White (20).

Measurement of the group's perceived effectiveness was determined using the self-report effectiveness scale on the *Group Styles Inventory* developed by Cooke and Lafferty (1988). It is a seven-question survey using a 5-point Likert scale. The instrument asks "to what extent" the respondent feels the seven elements were present in his/her group. The responses range from "not at all" to "to a very great extent."

I selected a variable for each question and labeled them Effect 1, Effect 2, Effect 3, Effect 4, Effect 5, Effect 6, Effect 7. These labels were used in the statistical analysis. However, for better comprehension of what is being measured or ranked, I compiled a list of more descriptive labels for the elements in the scale:

Effect 1 = Effectiveness

Effect 2 = Group benefit

Effect 3 = Commitment

Effect 4 = Preference

Effect 5 = Resourcefulness

Effect 6 = Quality

Effect 7 = Consensus.

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Hypothesis 2

Hypothesis 2a. There is no significant difference between the mean scores on Effect 1 of the treatment and control groups

Hypothesis 2b. There is no significant difference between the mean scores of male and female participants of Effect 1.

Hypothesis 2c. There is no significant difference between the mean scores of participants of various ethnic groups on Effect 1.

Hypothesis 2d. There is no significant interaction between treatment group or gender on Effect 1.

Hypothesis 2e. There is no significant interaction between treatment group and ethnicity on Effect 1.

Hypothesis 2f. There is no significant interaction between gender and ethnicity on Effect 1.

Hypothesis 2g. There is no significant three-way interaction among the three factors: treatment group, ethnicity, and gender.

All seven of the above sub-hypotheses were tested by three-way ANOVA for Effect 1. Effect 1 is the variable label assigned to the first question of the Group Effectiveness scale ($N = 60$).

Table 21 shows the means for the various categories of the control and treatment groups. All of the treatment-group means are higher than the control-group means.

Table 22 presents the results of the ANOVA for Effect 1.

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Table 21

Means for Effect 1 (Effectiveness)

	Male Treatment	Male Control	Female Treatment	Female Control	Total Treatment	Total Control
Black	4.333	4.000	4.250	3.714	4.286	3.750
White	4.333	2.667	4.286	3.600	4.300	3.250
Other	4.250	3.500	4.333	3.607	4.286	3.615
Total	4.308	3.250	4.278	3.667	4.290	3.552

Table 22

Three-way ANOVA Test for Effect 1 (Effectiveness)

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	11.093	11	1.008	1.483	.169
Treatment	6.349	1	6.349	9.336	.004*
GENDER	.173	1	.173	.255	.616
ETHNIC	.867	2	.434	.638	.533
Treatment * GENDER	.219	1	.219	.322	.573
Treatment * ETHNIC	.968	2	.484	.712	.496
GENDER * ETHNIC	.653	2	.327	.480	.622
Treatment * GENDER* ETHNIC	.682	2	.341	.501	.609
Error	32.640	48	.680		
Total	972.000	60			
Corrected Total	43.733	59			

* Significant at 0.05 level.

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Sub-hypotheses 2d, 2e, 2f, and 2g are all retained as there are no significant three-way or two-way interactions, as shown in Table 22. Therefore, the main-effect sub-hypotheses may be tested. Sub-hypotheses 2b and 2c are retained as their main effects are not significant. Sub-hypothesis 2a is rejected as Treatment is significant ($F = 9.336$, $df = 1, 48, p = 0.004$). This would indicate that the treatment group rated their group significantly higher than the control group on how effectively the group worked together.

Hypothesis 3

Hypothesis 3a. There is no significant difference between the mean scores on Effect 2 of the treatment and control groups.

Hypothesis 3b. There is no significant difference between the mean scores of male and female participants on Effect 2.

Hypothesis 3c. There is no significant difference between the mean scores of participants of various ethnic groups on Effect 2.

Hypothesis 3d. There is no significant interaction between treatment group and gender on Effect 2.

Hypothesis 3e. There is no significant interaction between treatment group and ethnicity on Effect 2.

Hypothesis 3f. There is no significant interaction between gender and ethnicity on Effect 2.

Hypothesis 3g. There is no significant three-way interaction among the three factors: treatment group, ethnicity, and gender.

All seven of the above sub-hypotheses were tested by three-way ANOVA for

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Effect 2. Effect 2 is the variable label assigned to the second question of the Group Effectiveness scale that ranks the preference for the group-generated solution versus the individually generated solution ($N = 60$).

Table 23 presents the means for treatment, control, gender, and ethnicity groups.

Table 23

Means for Effect 2 (Group Benefit)

	Male Treatment	Male Control	Female Treatment	Female Control	Total Treatment	Total Control
Black	4.000	3.000	3.875	3.143	3.929	3.125
White	4.667	2.000	3.714	2.600	4.000	2.375
Other	3.000	2.250	4.333	3.333	3.571	3.000
Total	3.846	2.250	3.889	3.095	3.871	2.862

All of the treatment-group means are higher than the control-group means. Table 24 presents the results of the ANOVA for Effect 2.

Sub-hypotheses 3d, 3e, 3f, and 3g are all retained as there are no significant three-way or two-way interactions, as shown in Table 24. Therefore, the main-effect sub-hypotheses for treatment group, gender, and ethnicity may be tested. Sub-hypotheses 3b and 3c are retained as the main effects of gender and ethnicity are not significant. Sub-hypotheses 3a is rejected as Treatment is significant ($F = 12.786$, $df = 1, 48$, $p = .001$). This indicates that the treatment group rated themselves significantly higher on their preference for the group's solution over their individually developed solution.

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Table 24

Three-way ANOVA Test for Effect 2 (Group Benefit)

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	27.739	11	2.522	2.071	.041
Treatment	15.568	1	15.568	12.786	.001*
GENDER	1.279	1	1.279	1.051	.310
ETHNIC	.598	2	.299	.245	.783
Treatment * GENDER	.728	1	.728	.598	.443
Treatment * ETHNIC	2.631	2	1.315	1.080	.348
GENDER * ETHNIC	4.509	2	2.255	1.852	.168
Treatment * GENDER* ETHNIC	1.727	2	.864	.709	.497
Error	58.444	48	1.218		
Total	773.000	60			
Corrected Total	86.183	59			

* Significant at 0.05 level.

Hypothesis 4

Hypothesis 4a. There is no significant difference between the mean scores on Effect 3 of the treatment and control groups.

Hypothesis 4b. There is no significant difference between the mean scores of male and female participants on Effect 3.

Hypothesis 4c. There is no significant difference between the mean scores of participants of various ethnic groups on Effect 3.

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Hypothesis 4d. There is no significant interaction between treatment group and gender on Effect 3.

Hypothesis 4e. There is no significant interaction between treatment group and ethnicity on Effect 3.

Hypothesis 4f. There is no significant interaction between gender and ethnicity on Effect 3.

Hypothesis 4g. There is no significant three-way interaction among the three factors: treatment group, ethnicity, and gender.

All seven of the above sub-hypotheses were tested by three-way ANOVA for Effect 3. Effect 3 is the variable label assigned to the third question on the Group Effectiveness scale that ranks the level of commitment to the group proposed solution (N= 60).

Table 25 presents the means for treatment, control, gender, and ethnicity groups. Table 25 shows that the total White, treatment-group mean of 3.500 exceeds the total White, control-group mean of 2.875. The Black, male, control-group mean exceeds that of the Black, male, treatment group.

Table 26 presents the results of the ANOVA for Effect 3.

Sub-hypotheses 4d, 4e, 4f, and 4g are all retained as there are no significant three-way or two-way interactions, as shown in Table 26. Sub-hypotheses 4a, 4b, and 4c are retained, as the main-effects treatment group, gender, and ethnicity are not significant. This would indicate that the treatment and control groups rate themselves equally on Effect 3.

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Table 25

Means for Effect 3 (Commitment)

Ethnicity	Male Treatment	Male Control	Female Treatment	Female Control	Total Treatment	Total Control
Black	4.333	5.000	4.000	3.571	4.143	3.750
White	4.667	2.333	3.000	3.200	3.500	2.875
Other	3.500	3.250	3.667	3.778	3.571	3.615
Total	4.154	3.125	3.556	3.571	3.807	3.448

Table 26

Three-way ANOVA Test for Effect 3 (Commitment)

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	18.780	11	1.707	1.340	.233
Treatment	1.221	1	1.221	.958	.332
GENDER	1.029	1	1.029	.808	.373
ETHNIC	5.803	2	2.901	2.277	.114
Treatment* GENDER	.955	1	.955	.750	.391
Treatment* ETHNIC	2.971	2	1.486	1.166	.320
GENDER* ETHNIC	2.707	2	1.354	1.062	.354
Treatment* GENDER*ETHNIC	5.682	2	2.841	2.230	.119
Error	61.153	48	1.274		
Total	872.000	60			
Corrected Total	79.933	59			

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Hypothesis 5

Hypothesis 5a. There is no significant difference between the mean scores on Effect 4 of the treatment and control groups.

Hypothesis 5b. There is no significant difference between the mean scores of male and female participants on Effect 4.

Hypothesis 5c. There is no significant difference between the mean scores of participants of various ethnic groups on Effect 4.

Hypothesis 5d. There is no significant interaction between treatment group and gender on Effect 4.

Hypothesis 5e. There is no significant interaction between treatment group and ethnicity on Effect 4.

Hypothesis 5f. There is no significant interaction between gender and ethnicity on Effect 4.

Hypothesis 5g. There is no significant three-way interaction among the three factors: treatment group, ethnicity, and gender.

All seven of the above sub-hypotheses were tested by three-way ANOVA for Effect 4. Effect 4 is the variable label assigned to the fourth question on the Group Effectiveness scale which asks the participant to rank their preference to work with a different group of people if asked to solve this type of problem again ($N = 60$). The Likert scale for this question is inverted in that the lower the number chosen for an answer, the more positive the answer.

Table 27 presents the means for treatment, control, gender, and ethnicity groups.

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Table 27

Effect 4 Means (Preference)

Ethnicity	Male Treatment	Male Control	Female Treatment	Female Control	Total Treatment	Total Control
Black	1.667	1.000	1.625	2.429	1.643	2.250
White	1.000	2.000	1.714	1.600	1.500	1.750
Other	1.750	1.250	1.000	2.000	1.429	1.769
Total	1.539	1.500	1.556	2.048	1.548	1.897

The treatment-group total is consistently lower than the control-group total. However, that is not the case in any other pairs of columns of means.

Table 28 presents the results of the three-way ANOVA of Effect 4.

Sub-hypotheses 5d, 5e, 5f, and 5g are all retained as there are no significant three-way or two-way interactions, as shown in Table 28. Therefore, the main-effect sub-hypotheses for treatment group, gender, and ethnicity may be tested. Sub-hypotheses 5a, 5b, and 5c are retained as the main-effects treatment group; gender and ethnicity are not significant. Table 28 indicates that there are no significant differences between the various categories of treatment and control groups.

Hypothesis 6

Hypothesis 6a. There is no significant difference between the mean scores on Effect 5 of the treatment and control groups.

Hypothesis 6b. There is no significant difference between the mean scores of male and female participants on Effect 5.

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Table 28

Three-way ANOVA Test for Effect 4 (Preference)

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	9.132	11	.830	.675	.755
Treatment	.681	1	.684	.556	.459
GENDER	.854	1	.854	.694	.409
ETHNIC	.219	2	.109	.089	.915
Treatment * GENDER	1.017	1	1.017	.826	.368
Treatment * ETHNIC	.233	2	.117	.095	.910
GENDER * ETHNIC	.844	2	.422	.343	.711
Treatment * GENDER*ETHNIC	4.290	2	2.145	1.743	.186
Error	59.051	48	1.230		
Total	245.000	60			
Corrected Total	68.183	59			

Hypothesis 6c. There is no significant difference between the mean scores of participants of various ethnic groups on Effect 5.

Hypothesis 6d. There is no significant interaction between treatment group and gender on Effect 5.

Hypothesis 6e. There is no significant interaction between treatment group and ethnicity on Effect 5.

Hypothesis 6f. There is no significant interaction between gender and ethnicity on Effect 5.

Hypothesis 6g. There is no significant three-way interaction among the three

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factors: treatment group, ethnicity, and gender.

All seven of the above sub-hypotheses were tested by three-way ANOVA for Effect 5. Effect 5 is the variable label assigned to the fifth question on the Group Effectiveness scale ranking the group's use of its resources ($N = 60$). The Likert scale for this question is inverted in that the lower the number chosen for an answer, the more positive the answer.

Table 29 presents the means for treatment, control, gender, and ethnicity groups. Remembering that the lower the mean the better, the total treatment mean of 1.581 is slightly lower than the total control mean of 1.655. However, the differences between the treatment and control groups are not consistent: some are higher, some lower.

Table 30 presents the results of the three-way ANOVA of Effect 5. Sub-hypotheses 6d, 6e, 6f, and 6g are all retained as there are no significant three-way or two-way interactions as shown in Table 30. Therefore, the main-effect sub-hypotheses for treatment group, gender, and ethnicity may be tested. Sub-hypotheses 6a, 6b, and 6c are retained as the main-effects treatment group; gender and ethnicity are not significant. Table 30 indicates that the groups were statistically equal in their perceived use of their resources.

Hypothesis 7

Hypothesis 7a. There is no significant difference between the mean scores on Effect 6 of the treatment and control groups.

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Table 29

Effect 5 Means (Resourcefulness)

Ethnicity	Male Treatment	Male Control	Female Treatment	Female Control	Total Treatment	Total Control
Black	1.500	1.000	1.125	1.429	1.286	1.375
White	1.000	2.333	1.714	2.000	1.500	2.125
Other	2.000	1.250	2.667	1.667	2.286	1.539
Total	1.539	1.625	1.611	1.667	1.581	1.655

Table 30

Three-way ANOVA Test for Effect 5 (Resourcefulness)

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	10.582	11	.962	.704	.729
Treatment	3.163E-02	1	3.163E-02	.023	.880
GENDER	.680	1	.680	.497	.484
ETHNIC	2.829	2	1.415	1.035	.363
Treatment * GENDER	7.203E-02	1	7.203E-02	.053	.819
Treatment * ETHNIC	5.812	2	2.906	2.126	.130
GENDER * ETHNIC	.500	2	.250	.183	.833
Treatment*GENDER*ETHNIC	1.403	2	.701	.513	.602
Error	65.601	48	1.367		
Total	233.000	60			
Corrected Total	76.183	59			

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Hypothesis 7b. There is no significant difference between the mean scores of male and female participants on Effect 6.

Hypothesis 7c. There is no significant difference between the mean scores of participants of various ethnic groups on Effect 6.

Hypothesis 7d. There is no significant interaction between treatment group and gender on Effect 6.

Hypothesis 7e. There is no significant interaction between treatment group and ethnicity on Effect 6.

Hypothesis 7f. There is no significant interaction between gender and ethnicity on Effect 6.

Hypothesis 7g. There is no significant three-way interaction among the three factors: treatment group, ethnicity, and gender.

All seven of the above sub-hypotheses were tested by three-way ANOVA for Effect 6. Effect 6 is the variable label assigned to the sixth question on the Group Effectiveness scale ranking the quality of the group-generated solution ($N = 60$).

Table 31 presents the means for treatment, control, gender, and ethnicity groups. The females in the treatment group were consistently higher than the females in the control group. The higher means varied between males in the treatment group and males in the control group. As a result, the total-treatment mean of 4.194 is only slightly higher than the total-control mean of 3.793.

Table 32 presents the results of the three-way ANOVA of Effect 6. Sub-hypotheses 7d, 7e, 7f, and 7g are all retained as there are no significant three-way

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Table 31

Effect 6 Means (Quality)

Ethnicity	Male Treatment	Male Control	Female Treatment	Female Control	Total Treatment	Total Control
Black	3.667	5.000	4.375	3.714	4.071	3.875
White	4.667	4.333	4.286	3.400	4.400	3.750
Other	4.000	3.500	4.333	3.889	4.143	3.769
Total	4.000	4.000	4.333	3.714	4.194	3.793

Table 32

Three-way ANOVA Test for Effect 6 (Quality)

Source	Type III Sum of Squares	*df*	Mean Squares	*F*	Sig.
Corrected Model	8.846	11	.804	.592	.825
Treatment	.656	1	.656	.483	.490
GENDER	.404	1	.404	.297	.588
ETHNIC	.643	2	.321	.237	.790
Treatment*GENDER	1.831	1	1.831	1.349	.251
Treatment*ETHNIC	1.631	2	.816	.601	.552
GENDER*ETHNIC	2.174	2	1.087	.801	.455
Treatment*GENDER*ETHNIC	1.793	2	.896	.660	.521
Error	65.154	48	1.357		
Total	1034.000	60			
Corrected Total	74.000	59			

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or two-way interactions as shown in Table 32. Therefore, the main-effect sub-hypotheses for treatment group, gender, and ethnicity may be tested. Sub-hypotheses 7a, 7b, and 7c are retained as the main-effects treatment group; gender and ethnicity are not significant. The treatment and control groups ranked themselves statistically the same on the quality of the solution generated by their groups.

Hypothesis 8

Hypothesis 8a. There is no significant difference between the mean scores on Effect 7 of the treatment and control groups.

Hypothesis 8b. There is no significant difference between the mean scores of male and female participants on Effect 7.

Hypothesis 8c. There is no significant difference between the mean scores of participants of various ethnic groups on Effect 7.

Hypothesis 8d. There is no significant interaction between treatment group and gender on Effect 7.

Hypothesis 8e. There is no significant interaction between treatment group and ethnicity on Effect 7.

Hypothesis 8f. There is no significant interaction between gender and ethnicity on Effect 7.

Hypothesis 8g. There is no significant three-way interaction among the three factors: treatment group, ethnicity, and gender.

All seven of the above sub-hypotheses were tested by three-way ANOVA for Effect 7. Effect 7 is the variable label assigned to the seventh question on the Group

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Effectiveness scale ranking the group's ability to effectively reach a consensus decision ($N = 60$).

Table 33 presents the means for treatment, control, gender, and ethnicity groups. The means were mixed for males in the treatment and control groups. The means for treatment group males were higher except for Black males. The females in the treatment group had consistently higher means than the females in the control group. The total treatment-group means were higher than the total control-group means.

Table 34 presents the results of the three-way ANOVA of Effect 7.

Sub-hypotheses 8d, 8e, 8f, and 8g are all retained as there are no significant three-way or two-way interactions as shown in Table 34.

Therefore, the main-effect sub-hypotheses for treatment group, ethnicity, and gender may be tested. Sub-hypothesis 8a, 8b, and 8c are retained as the main-effect treatment, gender, and ethnicity are not significant. The treatment- and control-groups ranks on this element are statistically the same.

Table 33

Effect 7 Means (Consensus)

Ethnicity	Male Treatment	Male Control	Female Treatment	Female Control	Total Treatment	Total Control
Black	4.167	5.000	4.625	3.857	4.429	4.000
White	4.667	4.000	4.143	3.200	4.300	3.500
Other	4.250	3.500	4.333	3.444	4.286	3.462
Total	4.301	3.875	4.389	3.524	4.355	3.621

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Table 34

Three-way ANOVA Test for Effect 7 (Consensus)

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	13.472	11	1.225	1.004	.457
Treatment	2.990	1	2.990	2.452	.124
GENDER	1.158	1	1.158	.949	.335
ETHNIC	1.973	2	.987	.809	.451
Treatment * GENDER	1.200	1	1.200	.984	.326
Treatment * ETHNIC	1.486	2	.743	.610	.548
GENDER * ETHNIC	.937	2	.468	.384	.683
Treatment * GENDER*ETHNIC	1.023	2	.512	.420	.660
Error	58.528	48	1.219		
Total	1032.000	60			
Corrected Total	72.000	59			

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Nonparametric tests

Table 35 shows that Effect 4 ($F = 2.038$, $df = 11, 48$, $p = .045$), Effect 5 ($F = 3.367$, $df = 11,48$, $p = .022$), and Effect 7 ($F = 2.537$, $df = 11,48$, $p = .013$) have unequal distribution of variance.

Table 35

Levene's Test of Equality of Error Variances

Variables	*F*	*df*1	*df*2	Sig.
Effect 1	1.527	11	48	.153
Effect 2	1.292	11	48	.258
Effect 3	.748	11	48	.688
Effect 4	2.038	11	48	.045*
Effect 5	3.367	11	48	.022*
Effect 6	1.747	11	48	.091
Effect 7	2.537	11	48	.013*

This violates one of the assumptions of ANOVA. I have used nonparametric tests on the Effects 4, 5, and 7 variables to accommodate these violations.

Table 36 shows the means for the Mann-Whitney test of Effects 4, 5, and 7. Table 37 presents the results of the Mann-Whitney tests on the Effects variables.

Table 37 indicates a significant difference in the means of the treatment and control groups on Effect 7 ($Z = -1.981$, $p = 0.048$) in favor of the treatment group. This supports the rejection of null hypothesis 8a.

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Table 36

Descriptive for Mann-Whitney Test

	Treatment *N*	Mean Rank	Sum of Ranks
Effect 4	CntrlGrp 29	32.91	954.50
	Treatmnt 31	28.24	875.50
	Total 60		
Effect 5	CntrlGrp 29	29.79	864.00
	Treatmnt 31	31.16	966.00
	Total 60		
Effect 7	CntrlGrp 29	26.14	758.00
	Treatmnt 31	34.58	1072.00
	Total 60		

Table 37

Test Statistics for Mann-Whitney

Test	Effect 4	Effect 5	Effect 7
Mann-Whitney U	379.500	429.000	323.000
Wilcoxon W	875.500	864.000	758.000
Z	-1.177	-.360	-1.981
Asymp.Sig. (2-tailed)	.239	.719	.048

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No other significant differences were found using the nonparametric Mann-Whitney and Kruskal-Wallace tests for gender and ethnic analysis.

Summary of findings for hypotheses 2 to 8

Table 38 shows only 3 significant differences. In each case, the treatment group ranked their group as significantly more effective than did the control group. The treatment group also had a significantly higher preference for the group-generated solutions than the individually generated solutions. The treatment group ranked their ability to reach a consensus decision significantly higher than did the control group. Neither gender, ethnicity, nor any of the combinations of the three variables had any significant impact on the group's perceived effectiveness.

Table 38

Summary of Group Effectiveness Hypotheses

Effects	Hypotheses	A	B	C	D	E	F	G
1	2	sig.	ns	ns	ns	ns	ns	ns
2	3	sig.	ns	ns	ns	ns	ns	ns
3	4	ns	ns	ns	ns	ns	ns	ns
4	5	ns	ns	ns	ns	ns	ns	ns
5	6	ns	ns	ns	ns	ns	ns	ns
6	7	ns	ns	ns	ns	ns	ns	ns
7	8	sig.	ns	ns	ns	ns	ns	ns

Note. sig = significant; ns = not significant.

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Group Styles Hypotheses 9-20

The Group Styles category has 12 hypotheses, numbered 9-20, that were tested using *t* tests. For all tests, alpha equals .05. The Mann-Whitney and Kruskal-Wallis nonparametric tests were also used.

The *Group Styles Inventory* by Cooke and Lafferty (1988) is a categorizing instrument that also indicates the extent of the trait categorized. Each of the 12 styles has 6 questions (72 in all) that are rated "0" to "4" by each group participant. These ratings are levels of agreement with the question/statement ranging from a low of "not at all" to a high of "to a very great extent."

Cooke and Lafferty gave two names to each of the 12 styles in their inventory. One name used the clock positions 1 to 12. The other name is more descriptive in explaining what the inventory is ranking. I assigned a variable to each of the group styles by labeling them Clocks 1 to 12 for use in the statistical tables.

Clock 1 = Humanistic-Encouraging

Clock 2 = Affiliative

Clock 3 = Approval

Clock 4 = Conventional

Clock 5 = Dependent

Clock 6 = Avoidance

Clock 7 = Oppositional

Clock 8 = Power

Clock 9 = Competitive

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Clock 10 = Perfectionistic

Clock 11 = Achievement

Clock 12 = Self-Actualizing

Group Styles hypotheses

The list of Group Styles Null hypotheses follows:

Hypothesis 9. There is no significant difference between the mean scores on the Humanistic-Encouraging scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 10. There is no significant difference between the mean scores on the Affiliative scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 11. There is no significant difference between the mean scores on the Approval scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 12. There is no significant difference between the mean scores on the Conventional scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 13. There is no significant difference between the mean scores on the Dependent scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 14. There is no significant difference between the mean scores on the Avoidance scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 15. There is no significant difference between the mean scores on the Oppositional scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 16. There is no significant difference between the mean scores on the Power scale on the *Group Styles Inventory* of the treatment and control groups.

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Hypothesis 17. There is no significant difference between the mean scores on the Competitive scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 18. There is no significant difference between the mean score on the Perfectionistic scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 19. There is no significant difference between the mean scores on the Achievement scale on the *Group Styles Inventory* of the treatment and control groups.

Hypothesis 20. There is no significant difference between the mean scores on the Self-Actualizing scale on the *Group Styles Inventory* of the treatment and control groups.

Table 39 shows the means for the treatment and control groups in the Group Styles analysis, and the results of the *t* tests.

All of the treatment-group means except Clock 6 exceed those of the control group. The correct interpretation can be made only in comparison to the means established for an "effective group" by Cooke and Lafferty (1988). Figure 2 on page 134 in chapter 5 graphically makes the comparison.

Table 39 shows that the significant tests are Humanistic-Encouraging ($t = 3.536$, $df = 1, 61$, $p = 0.001$), Affiliative ($t = 3.732$, $df = 1, 61$, $p = 0.000$), Achievement ($t = 2.907$, $df = 1,61$, $p = 0.005$), and Self-Actualizing ($t = 3.988$, $df = 1, 61$ $p = 0.000$).

Nonparametric tests

Table 40 shows the paired-mean, clock-style rankings by control and treatment groups for the Mann-Whitney test. Table 40 shows that the control group had a higher ranking for Avoidance than the treatment group. All other pairs parallel the *t*-tests.

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Table 39

Clock Style Means and t-Tests

Clock	Style	Treatment Group	Control Group	t test	P
Clock 1	Humanistic-Encouraging	18.742	14.938	3.536	.001*
Clock 2	Affiliative	19.258	14.688	3.732	.000*
Clock 3	Approval	7.129	5.531	1.571	.121
Clock 4	Conventional	7.323	7.125	0.235	.816
Clock 5	Dependent	8.387	7.000	1.256	.214
Clock 6	Avoidance	4.581	5.750	1.080	.284
Clock 7	Oppositional	4.194	3.250	1.049	.298
Clock 8	Power	7.323	6.156	1.096	.277
Clock 9	Competitive	3.903	3.375	0.597	.552
Clock 10	Perfectionistic	5.097	3.500	1.986	.051
Clock 11	Achievement	16.226	12.656	2.907	.005*
Clock 12	Self-Actualizing	18.548	14.063	3.988	.000*

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Table 40

Mann-Whitney Clock Style Ranks

	Treatment		N	Mean Rank	Sum of Ranks
Clock 1- Humanistic	Control Group		32	25.72	823.00
Encouraging	Treatment		31	38.48	1193.00
		Total	63		
Clock 2 - Affiliative	Control Group		32	24.64	788.50
	Treatment		31	39.60	1227.50
		Total	63		
Clock 3 - Approval	Control Group		32	28.80	921.50
	Treatment		31	35.31	1094.50
		Total	63		
Clock 4 -	Control Group		32	31.30	1001.50
Conventional	Treatment		31	32.73	1014.50
		Total	63		
Clock 5 - Dependent	Control Group		32	28.41	909.00
	Treatment		31	35.71	1107.00
		Total	63		
Clock 6 - Avoidance	Control Group		32	33.14	1060.50
	Treatment		31	30.82	955.50
		Total	63		
Clock 7 -	Control Group		32	29.16	933.00
Oppositional	Treatment		31	34.94	1083.00
		Total	63		
Clock 8 - Power	Control Group		32	29.02	928.50
	Treatment		31	35.08	1087.50

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Table 40--*Continued.*

		Total	63		
Clock 9 -	Control Group		32	31.45	1006.50
Competitive	Treatment		31	32.56	1009.50
		Total	63		
Clock 10 -	Control Group		32	27.31	874.00
Perfectionistic	Treatment		31	36.84	1142.00
		Total	63		
Clock 11 -	Control Group		32	25.94	830.00
Achievement	Treatment		31	38.26	1186.00
		Total	63		
Clock 12 -	Control Group		32	24.31	778.00
Self-Actualizing	Treatment		31	39.94	1238.00
		Total	63		

Table 41 shows the paired means with significant differences as evidenced by the Mann-Whitney tests. They are: Humanistic-Encouraging ($U = 295, p = 0.006$), Affiliative ($U = 260, p = 0.001$), Perfectionistic ($U = 346, p = 0.038$), Achievement ($U = 302, p = 0.007$), and Self-Actualizing ($U = 250$, p = 0.001). In all of the significant differences, the treatment group has the higher scores which is meaningless until compared with the scores of an "effective group."

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Summary of findings of group styles hypotheses

Four of the five styles with significant differences are in the Constructive style cluster. They are Humanistic-Encouraging, Affiliative, Achievement, and Self-Actualizing. The remaining significant style is Perfectionistic which is in the Aggressive/Defensive style cluster.

Table 41

Mann-Whitney Test Statistics for Clock Styles

Clock Styles	Mann-Whitney U	Asymp Sig. (2 tailed)
Clock 1 - Humanistic-Encouraging	295.000	0.006*
Clock 2 - Affiliative	260.500	0.001*
Clock 3 - Approval	393.500	0.157
Clock 4 - Conventional	473.500	0.756
Clock 5 - Dependent	381.000	0.113
Clock 6 - Avoidance	459.500	0.614
Clock 7 - Oppositional	405.000	0.207
Clock 8 - Power	400.500	0.187
Clock 9 - Competitive	478.500	0.808
Clock 10 - Perfectionistic	346.000	0.038*
Clock 11 - Achievement	302.000	0.007*
Clock 12 - Self-Actualizing	250.000	0.001*

* Significant at 0.05 level.

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Group Development Hypothesis

Hypothesis 21: there are no observed differences in the effectiveness rankings and in the stages of group-development ratings between students who participate as a group in the Bcube module and those who do not.

Group development questionnaire

The researcher and the research assistant who were trained to assess the functioning of the participants as groups completed the *Group Development Questionnaire*. See Chapter 2 for a detailed explanation of the stages of group development. This instrument was used to structure the collection of qualitative data on 6 of the 11 groups. It was chosen because it could give an indication of a difference in the stages of group development of each treatment and control group. This was of interest to determine if the Bcube module would impact groups' progression through the various stages. The instrument also ranks the presence of the characteristics of effective groups.

The GDQ contains the following scales which correspond to the four stages of group development:

Scale I: Dependency/Inclusion = Level I

Scale II: Counterdependency/Fight = Level II

Scale III: Trust/Structure = Level III

Scale IV: Work and Productivity - Level IV

Table 42 shows the control group profiles on the four scales.

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Table 42

Control Group Profile of the Stages of Group Development

Groups	Level I	Level II	Level III	Level IV	Scale Grand Total
Control Group 7	32	24	31	27	
Control Group 9	34	29	18	12	
Control Group 11	33	24	31	29	
Scale Totals	99	77	80	68	324
Mean	33.00	25.67	26.67	22.67	
Percentage	31%	24%	25%	21%	
Range	32-33	24-29	18-31	12-29	
Range Difference	2	5	13	17	

highest mean score to be Level I (Dependency/Inclusion) at 33. Level III (Trust/Structure) scores at 26.67, Level II (Counterdependency/Fight) scores at 25.67, and Level IV (Work/Productivity) scores at 22.67. The scores indicate that the control group was dealing more with issues of dependence and inclusion than with other developmental issues. The percentage scores for each level are a measure of the amount of group energy focused on each GDQ scale. The Percentage scores are calculated by dividing the Scale Grand Total into each Scale Total. Thirty-one percent of this group's energy is focused on Level I; 25% on Level III; 24% on Level II; and 21% on Level IV.

The observed rates of performance varied widely on two scales among the three subgroups that make up the overall control group as shown by the range difference scores

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Level III (13) and Level IV (17). The observer's computed effectiveness rating for this group is 56.8. The effectiveness ratio is obtained by dividing the group's mean score on scale IV by the maximum score that the group could have achieved on that scale. Since the items that make up the GDQ scale reflect research findings with regard to effective work-oriented groups, the effectiveness ratio provides a way to estimate the observer's perceptions of a group's effectiveness (Wheelan, 1994b).

Table 43 shows the treatment group profiles on the four scales and shows the highest mean score to be Level I at 39.8. Level II mean score is 29.8, Level III mean score is 28.5, and Level IV mean score is 25.7.

Table 43

Treatment Group Profile of the Stages of Development

Groups	Level I	Level II	Level III	Level IV	Scale Grand Total
Treatment Group 6	48.5	30	34	28.5	
Treatment Group 8	36	31	25.5	24	
Treatment Group 10	35	28.5	26	24.5	
Scale Totals	119.5	89.5	85.5	77	371.5
Mean	39.83	29.83	28.5	25.67	
Percentage	32%	24%	23%	21%	
Range	48.5-35	31-28.5	34-25.5	28.5-24	
Range Difference	13.5	2.5	8.5	4.5	

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The scores indicate that the group was dealing more with issues of dependence and inclusion than with other developmental issues. The percentage scores for each level show that almost 32% of this group's energy is focused on Level I (Dependency/Inclusion); 24% on Level II (Counterdependency/Fight); 23% on Level III (Trust/Structure); and 21% on Level IV (Work/Productivity).

The observed rates of performance varied most on Level I (12.5) and Level III (8.5) between the subgroups that make up the overall treatment group as shown by the range differences. The effectiveness ratio for the treatment composite group was 64.3%.

Summary of the group development hypothesis

The treatment group's effectiveness ratio was 64.3% versus the control group's effectiveness ratio of 56.8%. This indicates that the treatment group demonstrated more traits of an effectiveness group than did the control group. The mean scores of the treatment group were all higher than those of the control group indicating a higher perceived energy level in the treatment group. The percentage scores of the two groups were very close indicating that Bcube did not differentiate the treatment and control group on the point.

The first part of hypothesis 21 is rejected as there is a difference in the effectiveness ratings of the treatment and control groups. The second part of hypothesis 21 is retained as the percentage scores of the stages of group development are very close.

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CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter begins with a summary of the statement of the problem, reviews the purpose of the study, examines the relevant literature, discusses the theoretical framework, critiques the methodology, and discusses reliability and validity concerns. Then this chapter reports the findings as they relate to the research questions asked, compares the findings of this study with the current body of literature, and draws conclusions. Finally, the chapter discusses the implications of the conclusions, enumerates the limitations of the study, and makes recommendations for further research.

Summary

Statement of the Problem

In many classrooms, students are placed in group-learning situations and given assignments without a structured group or team-formation process. Research indicates that less learning occurs in this type of group-learning situation than in a situation where the group has first become a team (Kagan, 1994).

Felder and Brent (1994) state that working effectively in teams is not something people are born knowing how to do, nor is it a skill routinely taught in school. The

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traditional approach to team building in academe is to put three to five students together and to let them 'work it out' on their way to solving a problem. The suggested approach from literature is to prepare students with some instructional elements that will generate an appreciation of what teaming (as opposed to just working in groups) involves, and to foster the development of interpersonal skills that aid in team building and performance. This is how I envision the Bcube experience.

Purpose of the Study

The purpose of this study was: (1) to evaluate the effectiveness of three Bcube sessions with groups of college students as a method of bringing together individuals of varied backgrounds into a cooperative-learning situation and (2) to evaluate the effectiveness of Bcube process on posttest scores of a treatment group and a control group after both groups participated in a group-learning experience.

Literature Review

The Bcube process is a simulation with debriefing exercises that is used to increase communication and decrease anxiety in group formation. The literature was reviewed to find research related to the parameters of the Bcube process which are simulations, group orientation, team formation, debriefing, group development, communication in groups, group facilitation, and cooperative learning.

The order for the categories in this literature review is as follows:

1. Group orientation research
2. Simulations as a group formation strategy

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3. Debriefing research
4. Group development
5. Communication process in groups
6. Facilitation in groups
7. Summary of findings of cooperative learning research.

Group orientation

Members of effective groups need orientation training (Johnson & Johnson, 1995). Teamwork skills must be taught as purposefully and precisely as academic skills (Johnson et al., 1998). Pregrouping sessions provide an opportunity for group members to become acquainted and to establish group guidelines. Pregroup-orientation sessions increase the likelihood of goal achievement (Richards, Burlingame, & Fuhriman, 1990). Johnson et al. (1998) suggest that teamwork skills need to be taught and are important for the long-term success of learning groups. The skills needing to be learned by group members include decision making, trust building, communication, and conflict management. These skills, if mastered, are believed to increase group cohesiveness and group productivity. The practice field of the Bcube experience provides a format for group orientation as suggested by the literature.

Simulations as a group formation strategy

The search of literature for research in the area of using games and simulations for the express purpose of aiding learning group formation or preparing people to participate in groups revealed the work of Johnson and Johnson (1991, 1997), Johnson

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(1998), and Kagan (1994). This material is descriptive in giving procedures and strategies for teaching students social skills. An example of the strategies, or structures, as Kagan likes to call them, is think-pair-share where a student thinks about the answers to a question, discusses the answer with his partner, then shares the mutually constructed answer with the entire class. Another example is the Jigsaw where a teacher divides an assignment into parts for each group member. Each member is responsible to teach all the other members his part of the assignment. The Johnson et al. (1998) and Kagan (1994) sources incorporate games as a part of their strategies but do not label them as games. I found no research studies that used games as a method of pregroup orientation.

The literature seems to indicate that a variety of categories of games and simulations (i.e., decision making, strategic planning, leadership) is generally effective (Keys & Wolfe, 1990). The face validity of business simulation is its strongest asset (Byrne, 1979; Glazer et al., 1987; Kinnear & Klammer, 1987; Lucas, 1979; Wolfe & Jackson, 1989).

Gaming increases interest, involvement, and enthusiasm (Lant, 1989; McGrath, 1982; Rowland & Gardner, 1973). Gaming provides rapid, concrete, and consistent feedback and may be the most appropriate laboratory for testing dynamic models of decision making (Bass & Vaughn, 1966; Lant, 1989; Lant & Montgomery, 1987; Nees, 1983; Rowland & Gardner, 1973).

Two of the major drawbacks of gaming is its lack of generalizability (Lant, 1989; McGrath, 1982) and the increased cost of development and administration over the use of cases or simpler exercises (Keys & Wolfe, 1990).

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The National Research Council found interactive games to be of limited effectiveness as a teaching or training tool. The research they reviewed on interactive games showed that they are effective at instilling a positive attitude toward the subject matter and contributing toward learning in the short term, but they are not effective for learning complex concepts over longer periods of time (Druckman & Bjork, 1994).

The Druckman study also looked at the use of the team approach in teaching and training. Training people in teams was found to be more effective than individual learning on some topics and tasks, but the mechanics of exactly why this happens are still poorly understood.

Debriefing research

Torres and Macedo (2000) point out that the concept and recognition of the benefits of having students experience an event and then reflect on it go back to Aristotle and was revived by Dewey. The process of reflection, as defined by Torres and Macedo, consists of returning to the experience, which comprises recollecting the experience, replaying the events, or recounting them to others.

The old concept of reflection has taken on a new name: debriefing. However, it has retained its sense of importance. Baker and Jensen (1997) maintain that debriefing as a part of the overall educational process is pivotal in transforming experience into learning. An effective debriefing session helps the player reflect objectively on the learning experience and gain new knowledge from this reflection. Debriefing constitutes what is perhaps the best reason for playing a game or running a simulation: it is where

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most learning takes place (Torres & Macedo, 2000).

St. Germain and Leveualt (1997) indicate the purpose of debriefing is to make participants share their feelings and opinions about the learning experience. Debriefing, therefore, ensures learning symmetry through the sharing process of the session. The game may be meaningless, but it is a good excuse to debrief (Thiagarajah, 1998).

Several studies (Certo, 1976; Keys, 1977; McKenney, 1967; Wolfe, 1975) suggest that instructor guidance during the game and skilled debriefing after are key to providing learning and closure. DeBattista (1986) found that learning during games was greatest when there was periodic, structured feedback versus random feedback.

The Bcube experience makes extensive use of debriefing as a technique for surfacing mental models of group skills and process. Its use adds credence and relevance to the existing body of literature.

Group development

Group development occurs in predictable stages (Bennis & Shepard, 1956; Braaten, 1975; Dunphy, 1974; Parsons, 1961; Schutz, 1966; Spitz & Sadock, 1973; Tuckman, 1965; Yalom, 1975). Wheelan (1990) suggests an integrative model of group-developmental stages across all types of groups with four or five stages.

> Groups do develop. They can also regress or arrest in their development. Groups are confronted with apparently universal developmental tasks. The order in which they approach these tasks can vary depending on the circumstances in which groups are operating. Groups do appear to behave in ways that can be described as healthy and mature or pathological and destructive. (Wheelan, 1994a, p. 24)

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The Bcube experience is thought to facilitate a group's process through the stages of group development.

Communication process in groups

The basic elements of group culture and structure are learned as a result of interactions in many social situations and groups (Wheelan, 1994a). Communication is the most basic necessity in groups (Bavelas, 1950; Leavitt, 1951). Communication structure is formed at the onset of newly formed groups and determines group cohesiveness (Hare, 1976). Groups with high levels of cohesion tend to interact more (McGrath, 1984). The syndrome of higher levels of cohesion and increased interaction is often associated with greater productivity (Stodgill, 1972).

Two kinds of communication networks in groups have been identified– centralized and decentralized. In centralized communication networks, communication funnels through a central person or place. Decentralized networks are not dependent on the existence of the central person or place. Centralized networks lead to development of centralized organizational patterns, i.e., all information goes to one person who solves the problem. In decentralized networks, information goes to all members who participate in solving the problem and checking the results with the other group members (Cohen, 1962).

Centralized-communication networks are likely to inhibit group development, whereas decentralized-communication networks may help groups to develop to the work stage (Wheelan, 1994a).

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The Bcube experience is purported to be effective in promoting decentralized-communication networks.

Facilitation in groups

Individual group member's actions can increase or decrease group effectiveness. Members who express liking for, respect for, and trust in others facilitate cohesion in groups (Sorrentino & Sheppard, 1978). In contrast, group members who express anxiety, distrust, or defensiveness reduce group effectiveness (Sorrentino & Sheppard, 1978; Teichman, 1984).

The Bcube experience is purported to increase trust and break down barriers to group members' participation.

Summary of findings of cooperative learning research

Johnson et al. (1998) report that since 1898, 550 treatment and 100 correlational studies have been conducted on various facets of cooperation, competition, and individualistic efforts. However, most of these studies have been conducted in elementary schools; very few studies have been done at the secondary and college levels.

Cooperative learning has been shown to have a positive impact on academic performance across all race and gender lines (Cohen & Lotan, 1997; Sharan, 1994; Slavin, 1995a), but it also has been shown to have a positive impact on the social climate of the classroom (Slavin, 1995b; Stevens & Slavin, 1995). Gordon Allport (1954) asserts in his book *The Nature of Prejudice* that when students of diverse backgrounds have the opportunity to work and get to know one another on equal footing, they become friends

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and find it more difficult to hold prejudices against one another (Slavin, 1991, 1995b). However Slavin has found that in many schools, cross-ethnic interaction between students is superficial and competitive (Slavin, 1995b). The limited contact between students of diverse backgrounds fosters harsh stereotypes, and racial tensions persist (Crain et al., 1982; Oakes & Wells, 1995).

Cooperative-learning groups encourage positive social interaction between diverse groups, build cross-ethnic friendships, and reduce racial stereotyping, discrimination, and prejudice, allowing students to judge each other on merits rather than stereotypes (McLemore & Romo, 1998). Slavin and Cooper (1999) indicate that cooperative-learning strategies, when applied properly by trained teachers, work most of the time. However, they have found instances where some students were bothered by the social conflicts that arose during group activities (e.g., "Kids don't always listen to each other and get along"). The social skills and cooperative behaviors necessary for helping others in the group, listening to others, and "getting along" take time to develop. But according to Slavin and Cooper that is one of the reasons for using cooperative learning: to develop those social skills.

Although acts of intolerance and racism, in most cases, are more subtle today than they were 20 years ago (Vernay, 1996), there seems to be a resurgence of overt racist and violent manifestations of discrimination and prejudice on school campuses. If schools are to serve as a safe haven from violence and a place for students to learn how to be good citizens, the use of instructional strategies such as cooperative learning will need to be more widespread (Slavin & Cooper, 1999).

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Theoretical Framework

Bcube is a practice field for learning the social skills needed to be an "effective" member of a cooperative-learning team. See the conceptual map in Appendix A for a graphic look at the theory. Johnson et al. (1998) say that cooperative learning is a dual function of learning both academic subject matter (taskwork) and social skills (teamwork). Bcube serves as a practice field for the teamwork prior to focus on the taskwork.

Bcube does this by creating an environment where team members become aware of their individual mental models, those of others, and the necessity and desirability of creating group mental models that are closer to reality. The formation of group mental models requires the practiced use of social skills on the part of each member that breaks down the barriers to effective group-communication patterns and cohesiveness by promoting decentralized communication patterns. Literature suggests that decentralized communication patterns facilitate group development and group cohesiveness which facilitate group productivity (Cohen, 1962; Hare, 1976; McGrath, 1984; Stodgill, 1972; Wheelan, 1990). Having learned the proper use of the requisite social skills on the Bcube practice field, individuals are able to employ these skills on the playing field of their cooperative-learning groups.

The constructivist paradigm of learning is that the student actively participates in the learning process by linking "new" knowledge to the existing mental models or by creating new models that replace the old. College instruction is criticized for failing to involve students actively in the learning process and being focused on transmitting fixed

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bodies of information while ignoring (1) the preparation of students to engage in a continuing acquisition of knowledge and understanding and (2) the careful supervision of students reasoning about challenging problems (Association of American Colleges, 1985; Bok, 1986; Boyer, 1987; Johnson et al., 1998; National Institute of Education, 1984; Task Group on General Education, 1988).

> Within the new paradigm, faculty recognize that (a) long-term, hard, persistent efforts to achieve come from the heart, not the head, and (b) the fastest way to reach a student's heart is through personal relationships (Johnson & Johnson, 1989b). Students work together to construct their knowledge and as they succeed in doing so, they become committed to and care about each other's learning and each other as people. Caring about how much a person achieves and caring about him or her as a person go hand-in-hand (Johnson & Johnson, 1989a). In challenging learning situations, it is acts of caring and support that draw students together and move them forward. What sustains students' efforts is the knowledge that classmates care about, and are depending on, their progress. Love of learning and love of each other are what inspire students to commit more and more energy to their studies. (Johnson et al., 1998, p. 1:11).

Methodology

Sample

Participants in this study were men and women above the age of 18 who were students (graduate or undergraduate), spouses, or staff at Andrews University. There were 63 participants, 39 female and 24 male. Ethnicity was diverse with 7 Asians, 3 Asian Pacific Islanders, 22 Blacks, 1 Filipino, 3 Hispanics, 1 "Multi-culti," 1 Native American, 1 Tonganese, 20 Whites, and 4 who preferred not to respond to this question.

Design

In the design and execution of this research project, some of Turner and Meyer's (2000) recommendations in their article on studying the instructional context of

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classrooms were followed. The authors advocate "pushing theory" by using both qualitative and quantitative study methods simultaneously and as complementary modes of inquiry, data collection and analysis, thereby taking advantage of the strengths of each and compensating for the weaknesses of each.

They point to the mixed-model study design defined by Tashakkori and Teddlie (1998) where researchers mix not only methods but also approaches at other stages of the research process. The process, as they define it, has three stages, and the model used at each stage may differ resulting in six different models. The three stages are: (1) type of investigation (i.e., exploratory or confirmatory), (2) type of data collection and operations (i.e., quantitative and qualitative), and (3) type of analysis and inference (i.e., qualitative and statistical analysis and inference). Accordingly, the Meese, Blumenfeld, and Hoyle (1988) and the Blumenfeld, Puro, and Mergendoller (1992) studies model the approach chosen with this study by mixing survey ranking with observations (structured and unstructured).

Turner and Meyer (2000) posit four essential components for studying the instructional contexts of classrooms. They are: (1) The study of classroom context requires the investigation of more than one variable at a time; (2) Classroom context requires a qualitative component in the research program; (3) A study of classroom context should attempt to answer the How and Why questions in addition to the What questions; (4) The study of context requires that the researcher be present in the classroom. In my study, I have included elements of all four of the essentials listed above.

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The instrumentation used in this study included a pretest, a posttest, a group-effectiveness scale, a group-style inventory, a group-development questionnaire used as an observer check and rating sheet, and unstructured qualitative reflections of staff on each group.

Analysis

The results were generated by ANCOVA, ANOVA, and *t*-test analyses administered to test the study's 21 hypotheses; the Mann-Whitney and the Kruskal-Wallis tests for nonparametric data, and a modified version of the Group Development Questionnaire used to assess the groups' levels of functioning. The research study staff collaborated on selecting items from the GDQ scales that were most likely to be "observable." A listing of the modified questionnaire is included in chapter 3.

Internal and External Reliability Concerns

This is a detailed discussion of the reliability and validity of instruments used in this study. Reliability and validity have previously been established for the GSI when used with college students, and its use in this study is deemed appropriate. The GDQ was used outside of its suggested-use parameters as an observer checklist to compare with results of the self-report GSI inventory. No reliability or validity data are available for this kind of situational use of the GDQ. Interrater reliability for the GDQ in this study using Kappa's alpha was approximately 0.65.

The control of external factors to minimize situational contaminants included similar laboratory settings for control and treatment groups; the same time factor for

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learning of the assigned learning modules for control and treatment groups; and a constancy of conditions of the setting, room conditions, and time of day for both control and treatment groups.

Attempts to control for internal validity included the use of stratified-random assignment to control or treatment group. Stratification was based on race and gender to ensure heterogeneous groups, as suggested for cooperative-learning groups (Johnson and Johnson, 1994). No attempts were made to control for internal validity by using homogenous groups because of the desire to use findings in a diverse setting.

Other threats to internal validity were controlled as follows:

1. History (events that take place concurrently with the independent variable that can affect the dependent variable)—learning tasks, posttest, and instruments were given at the same time thus negating the potential for history to influence internal validity.

2. Selection bias (results from preexisting differences between groups are controlled by random assignment)—stratified random assignment provided some measure to control for selection bias. Selection bias obviously exists due to payment for time and selection of convenience sample of students and staff available for the study.

3. Maturation (processes occurring within the subjects during the course of the study as a result of time, e.g., growth, fatigue)—limited opportunity for maturation of subjects as the study lasted for 2 hours.

4. Mortality (arises from attrition from groups being compared)—no attrition from any group during his study.

Regarding external validity, generalizability to other setting or samples is related

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primarily to adequacy of the sampling design. If the characteristics of the study groups are representative of the population to which generalization is to occur, external validity is increased. The purpose of this study was to determine the effectiveness of the Bcube process in college students with anticipated generalization to other college students. The heterogeneity of the study groups increases the ability to generalize results to similar college study groups.

Critique of Research Design

Critique of research design is most effectively done by asking the question, "What was the overall intent of the research project?" The overall intent was to study the use of the Bcube process as a mechanism for bringing diverse students together to complete a cooperative-learning task. The research question, "Does the Bcube process make a difference?" lends itself to a quasi-experimental research design with treatment and control groups. A quasi-experimental design was appropriate since random selection was not possible for this study due to the size of a population that would have been desired and prohibitive costs of such a study.

Comparisons in this study were between groups of subjects, which was adequate for illuminating the relationship between independent and dependent variables.

Findings of the Study

The study asked four main questions about the effectiveness of the Bcube process. These main questions became the categories of my hypotheses. The four main categories of Learning, Group Effectiveness, Group Styles Utilized, and Stages of Group

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Development served as the context for the 21 hypotheses tested by this study.

My discussion in this section is limited to interpretation leading to a final answer, based on the study's findings, to each defined question. The emphasis of this section is how the findings confirm (or fail to confirm) the Bcube theory.

The Learning category included hypothesis 1 (with 7 subhypotheses a to g); the Group Effectiveness category included hypotheses 2 to 8; the Group Styles Utilized category included hypotheses 9 to 20, and the Stages of Group Development category concludes with hypothesis 21. The Learning category question is repeated below for ease of reference.

Learning

Research question 1

Will students who participate as a group in the Bcube module demonstrate increased learning of a given subject over those students who do not with respect to scores on a posttest?

Cooperative learning refers to a broad range of instructional methods in which students work together to learn academic content. Research comparing cooperative learning and traditional methods has found positive effects on the achievement of elementary and secondary students, especially when two key conditions are fulfilled. First, groups must be working toward a common goal; second, the success of the groups must depend on the individual learning of all group members, not on single group product (Slavin & Fashola, 1998). The Bcube module was designed to prepare groups to

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work toward a common goal and to emphasize the necessity of personal effort for group success. The control group in this study is a collaborative learning group in a traditional classroom setting as they are separated into groups and are assigned a learning task. The control-group members were told but not prepared to work in groups. Nor were they given any information about the two key conditions of group goal and individual effort for group success.

Question 1a. *Will students who participate as a group in the Bcube module demonstrate increased learning of a given subject area over those students who do not with respect to scores on the posttest?*

A significant difference was found between the mean adjusted posttest scores of the treatment group and the control group. However, the mean adjusted posttest scores of the control group were higher than those of the treatment group. The literature suggests that when a low complexity task is given, a centralized communication pattern is likely to develop, and performance on low complexity tasks is higher. Elements of a centralized communication pattern were recognized in the control group. This suggests a reason for the higher control-group scores on the posttest.

It also points to several possible confounding variables. The nature of the learning assignment may have been one such variable. Michealsen, Fink, and Knight (1997) state that if assignments are too easy, one member of the group will act on behalf of the group, making the decisions without involving or adequately teaching the other members of the group. This is complemented with a discussion with one of the male control-group members who already had a BA degree. He stated that at the beginning

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"those freshmen and sophomores didn't have a clue," meaning that they did not know which direction to take to remember algorithms for solving the blood gas problems. He took charge and showed them a pneumonic that he developed. Even though they did not get to share in the development of the process, it appeared to help their comprehension.

Another confounding variable may have been prior science knowledge. The selection of a task based on scientific knowledge followed the pattern of many studies using these types of tasks to limit the effect of prior knowledge. However, a great many of these studies were done at the K-12 level. It appears that the prevalence of nursing majors in the sample may have been a factor. The pretest-posttest research design was included to factor out this type of problem. It could not, however, account for subject preparation for this type of learning by prior science classes.

Another confounding variable could have been the effect of age and its related study maturity. In other words, a graduate student or an undergraduate senior or junior presumably has more mature study skills than a freshman or sophomore.

Question 1b. *Does gender affect the level of learning of students who participate as a group in the Bcube module over those students who do not with respect to scores on the posttest?*

The data show that the women in both the control and treatment groups scored lower than men on the pretest. However, they were able to reverse the direction of that gap, although they fell short of making the gap significant in their favor on the posttest. Women's scores on the pretest were significantly lower than men but were higher than men, though not significantly, on the posttest. This could imply that the women in this

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study benefitted more in learning with the cooperative-learning approach and the Bcube process.

Question 1c. *Does ethnicity affect the level of learning of students who participate as a group in the Bcube module over those students who do not with respect to scores on the posttest?*

The data show that no significant difference existed between the ethnic groups in levels of learning as measured by the posttest. The expectation suggested from literature is that Blacks should gain in both the control and treatment groups as both had some degree of group learning. However, the Blacks in the control group scored higher on the posttest than any other ethnic group. The Blacks in the treatment group scored lower on the posttest than any other ethnic group. The Blacks in the control group scored twice as high as Blacks in the treatment group. This would imply that the Blacks in this study benefitted less by participating in the Bcube process. The reasons for greater gains by Blacks in the control group are not clear.

Summary

Women made learning gains from pretest to posttest; men in the control group scored significantly higher than men in the treatment group; and Blacks were adversely affected by administration of the Bcube process. Previous findings of cooperative-learning research that gains in posttest scores occur across gender and racial lines are supported. The addition of the Bcube process did not increase posttest scores of the Blacks in the treatment group over those in the control group.

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Group Effectiveness

Research question 2

Will the group-effectiveness ratings of students who participate as a group in the Bcube module be higher than those of students who do not?

The group's perceived effectiveness rating was measured with the seven-item self-report Group-Effectiveness scale on the Group Styles Inventory (Cooke & Lafferty, 1988). Each of the seven items on the scale was tested by the Bcube gender and ethnicity variables as well as for interaction.

Question 2a. *Will the group-effectiveness ratings of students who participate as a group in the Bcube module be higher (lower on questions 4 and 5) than those of students who do not with respect to scores on the Group Effectiveness scale of the Group Styles Inventory?*

The treatment group rated their group significantly higher for Effectiveness (Effect 1), Group Benefit (Effect 2), and Consensus (Effect 7). For Commitment (Effect 3), Preference (Effect 4), Resourcefulness (Effect 5), and Quality (Effect 6), the control- and treatment-group rankings were statistically the same. This suggests that the Bcube process favorably impacted the treatment-group's perception that they did make decisions that all could accept, that they all benefitted from working together more than working alone, and that they were effective as a group.

Question 2b. *Does gender affect the group-effectiveness rating of students who participate as a group in the Bcube module over those students who do not with respect to scores on the Group Effectiveness scale of the Group Styles Inventory?*

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The data show no significant difference between female and male ratings. This suggests that the Bcube preparation had no difference by gender in its rating of effectiveness.

Question 2c. *Does ethnicity affect the group-effectiveness rating of students who participate as a group in the Bcube module over those students who do not with respect to scores on the Group Effectiveness scale of the Group Styles Inventory*?

The results show no significant difference in the ratings of the various ethnic groups. This suggests that the Bcube process made no difference by ethnicity in the rating of effectiveness.

Summary

The treatment group rated their group significantly higher for Effectiveness (Effect 1), Group Benefit (Effect 2), and Consensus (Effect 7). When the Bcube, gender, and ethnicity variables were combined on the seven effects, there was no interaction. This suggests that Bcube process is not better suited for a particular ethnic group or sex but is generally applicable for improving group-member perceptions of group effectiveness.

Group Styles Utilized

Research question 3

Will the methods of group interaction of students who participate as a group in the Bcube module be significantly different from those of students who do not?

Groups have distinct personalities or styles of interaction that are directly related

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to the styles exhibited by each of their members. These group styles are reflected in the way group members approach a particular task or problem and work with each other as a team.

Like people's personalities, group styles can be positive and effective, leading to high-quality solutions to which members are committed. Or they can be negative and defeating, leading to solutions of marginal quality (Human Synergistics, 1993).

The GSI is a 72-item self-scoring inventory that assesses the ways in which members interact with one another and approach their tasks during a meeting or specific problem-solving session (Cooke & Szumal, 1994). The statements focus on behaviors of the members, the atmosphere of the meeting, and the impact of the group on individual members.

The authors of the instrument maintain that effective decision making or problem solving is the product of the quality of the decision multiplied by the degree to which group members accept and support the decision (Human Synergistics, 1995).

The quality of an outcome or solution is related to the style or styles that a group decides to use. By identifying the style used and the extent to which it was used, some judgments can be made about the quality of its decisions or solutions (Kernaghan & Cooke, 1987).

The GSI categorizes the perceived conscious behaviors and the unconscious feelings of each group members into three "styles": constructive passive, and aggressive. Each "style" has four components or "clock positions" in a Circumplex similar to an analog clock.

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A constructive style is descriptive of groups in which members interact and approach the problem in ways that enable them to fulfill both interpersonal and performance-related needs. In the Constructive style, a balance exists between the interpersonal processes and the rational, task-focused processes. Specific types of behaviors assessed in this style include cooperation, consideration of alternatives, building on others' ideas, setting goals, focusing on objective, exchanging preliminary thoughts and ideas, open exchange of information, creativity and appropriate risk-taking, and mutual supportiveness among members (Cooke & Szumal, 1994). This suggests a decentralized-communication pattern as described by Cohen (1962).

The four "clock positions" in the Constructive-style cluster are:

Achievement	(11 o'clock)
Self-Actualizing	(12 o'clock)
Humanistic-Encouraging	(1 o'clock)
Affiliative	(2 o'clock)

The Constructive styles use the full potential of group members and produce consistently effective solutions (Human Synergistics, 1993, p. 9).

The passive style describes groups in which members behave in "safe" ways that promote the fulfillment of their people-oriented needs for security and acceptance. The emphasis is on pleasing others, avoiding threatening interactions, and being defensive. Specific types of behavior assessed in this style include quick acceptance of ideas, avoidance of even constructive conflict, siding with the majority without discussion, and

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development of a centralized-communication pattern as described by Cohen (1962).

The four "clock positions" in the Passive/Defensive cluster are:

Approval	(3 o'clock)
Conventional	(4 o'clock)
Dependent	(5 o'clock)
Avoidance	(6 o'clock)

Passive/Defensive group members typically assume a position that is subservient to the group as a whole (Human Synergistics, 1993, p. 22).

The aggressive style describes groups in which members approach problems in ways designed to promote their status and position and to fulfill security needs through task-related behaviors. Individual members view the task emphasis as a vehicle for fulfilling their own needs to win, exercise influence, and demonstrate their competence by doings things perfectly. Specific types of behavior assessed in the style include criticism of ideas, cutting remarks, power struggles, competition between members, interruptions, overt impatience, and irritability.

The four "clock positions" in the Aggressive/Defensive cluster are:

Oppositional	(7 o'clock)
Power	(8 o'clock)
Competitive	(9 o'clock)
Perfectionistic	(10 o'clock)

Aggressive/Defensive group members place themselves above the group in an effort to fulfill their need to win (Human Synergistics, 1993, p. 35).

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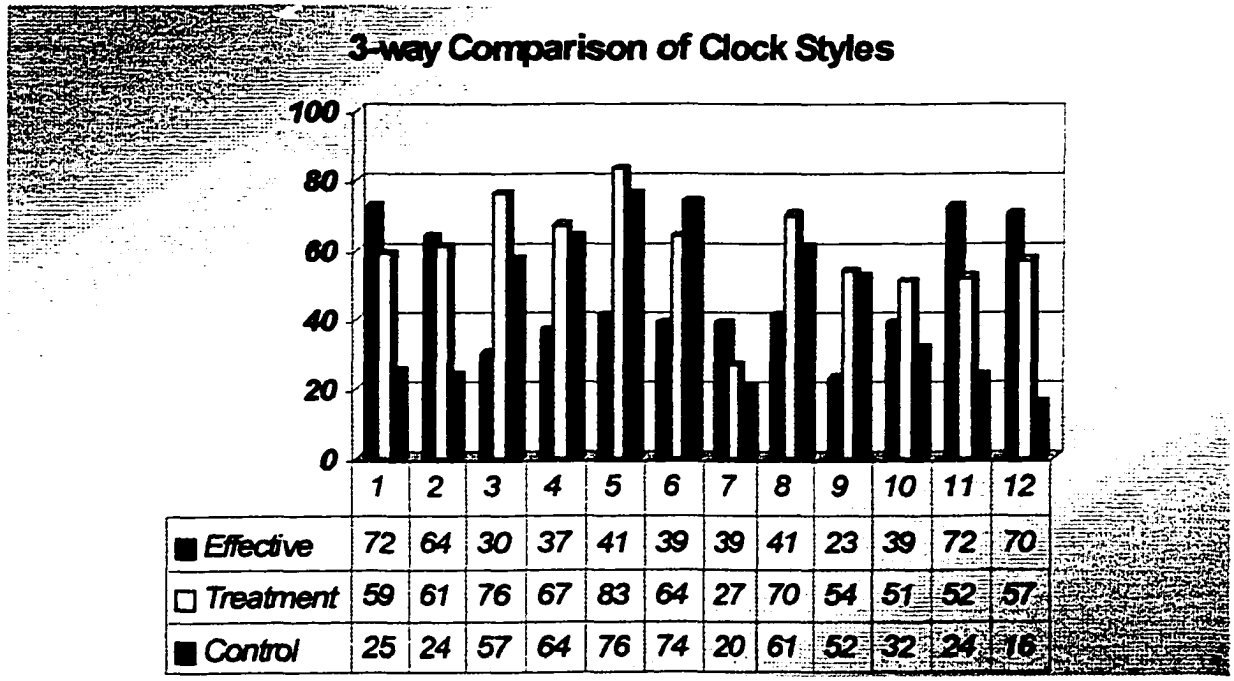
Figure 2 charts the percentiles of Effective Groups, developed by Cooke and Lafferty (1988), against the percentiles of the treatment and control groups.

The profile (the "effective norm group" or "effective group") is an average of 10 groups who were able to maximize their team score over their individual score while at the same time getting and maintaining a high level of commitment for the solution from all group members. In the Constructive cluster styles (11, 12, 1, 2), all four scales are well above the 50th percentile. Humanistic-Encouraging and Achievement are at the 72nd percentile, while Self-Actualizing is at the 70th percentile. Affiliative is the lowest in the cluster at the 64th percentile.



	1	2	3	4	5	6	7	8	9	10	11	12
Effective	72	64	30	37	41	39	39	41	23	39	72	70
Treatment	59	61	76	67	83	64	27	70	54	51	52	57
Control	25	24	57	64	76	74	20	61	52	32	24	16

Figure 2. Three-way comparison of clock styles of effective, treatment, and control groups.

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In the Passive/Defensive cluster (styles 3, 4, 5, 6), the Effective group has all four scales well below the 50th percentile. The Approval style is the lowest in this cluster at the 30th percentile. In the Aggressive/Defensive cluster (styles 7, 8, 9, 10), the Effective group has all four scales well below the 50th percentile. The Competitive style is the lowest at the 23rd percentile indicating that there is not a lot of infighting or a need to impress each other in these norming groups.

Figure 3 is the group styles circumplex for the treatment group. Figure 4 is the group styles circumplex for the control group. The shadings on the circumplexes show the percentile extensions on each scale. Each style is a separate scale with its own percentile ranks. The circumplexes are presented here to graphically present a complete picture of the differences between the treatment group and the control group in their self-perceived use of the various group styles. With these graphics available for quick reference, I now present my conclusions on each of the 12 group styles tested.

Question 9. *Will the Humanistic-Encouraging ratings of students who participate as a group on the Bcube module be higher than those of students who do not, with respect to scores on the Humanistic-Encouraging scale of the Group Styles Inventory?*

The treatment group's ratings are significantly higher than the control group's. The control group ranked in the "low" category on the Circumplex at the 25th percentile. The treatment group ranked in the"medium" category at the 59th percentile. The "effective" group has a ranking in the "medium" category at the 72nd percentile. Humanistic-Encouraging groups are constructive, sensitive, and supportive of members. People in these groups are interested in each other's growth and development,

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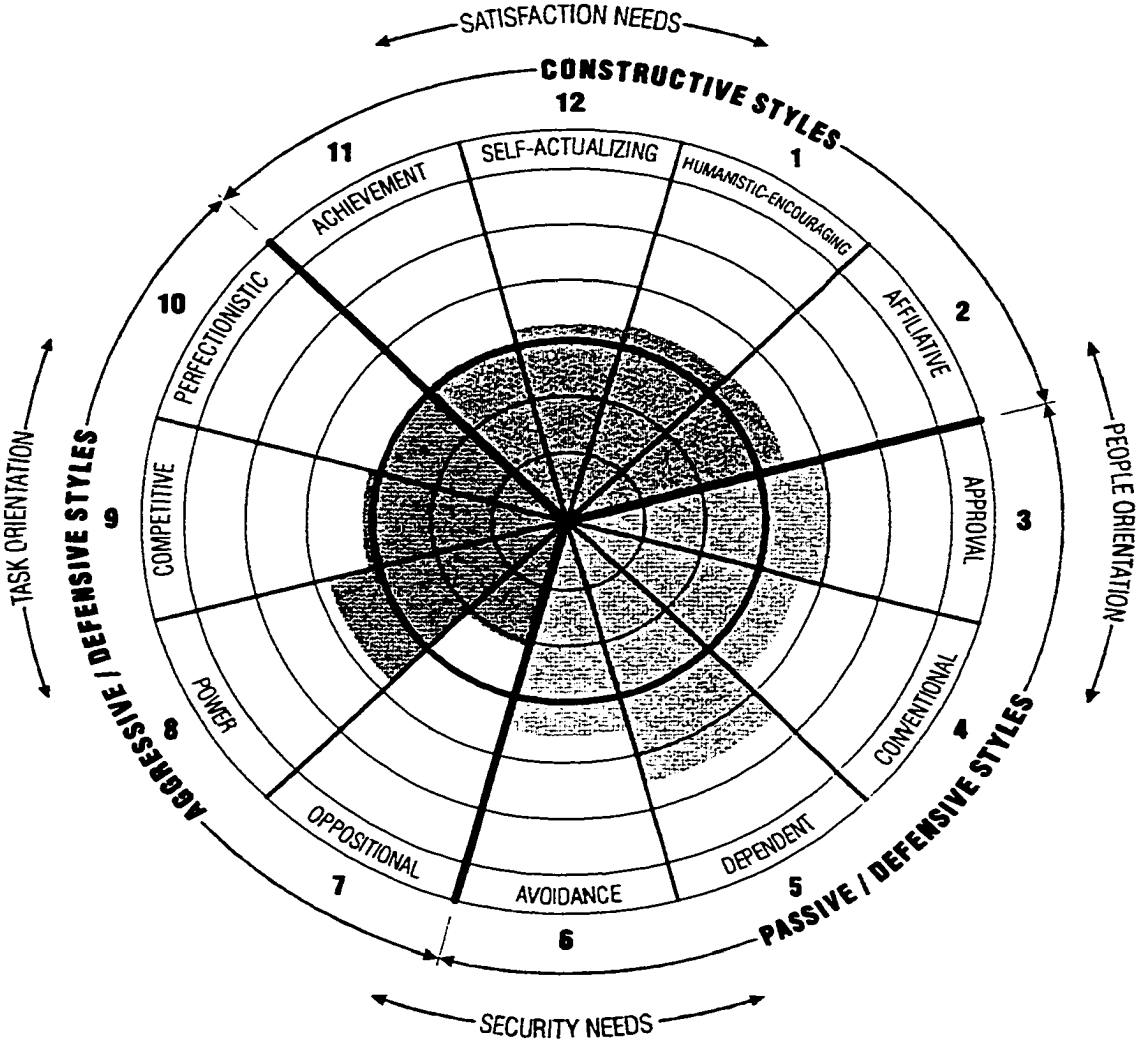

Figure 3. Treatment group circumplex

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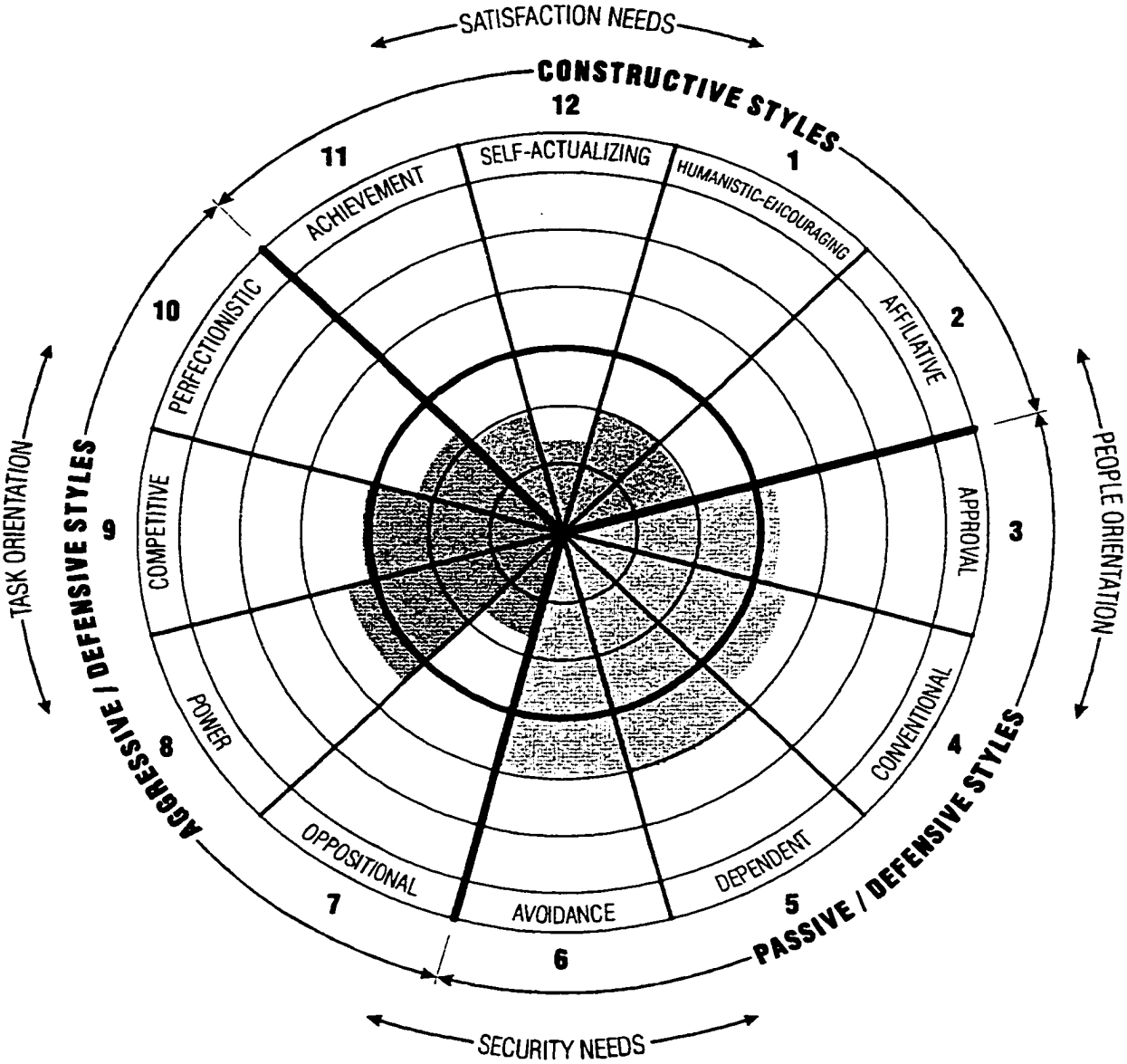

Figure 4. Control group circumplex

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provide one another with assistance and support, and constructively build on the suggestions and ideas presented (Human Synergistics, 1993). Usually they are able to do this without sacrificing completion of the task at hand. Those groups with high Humanistic-Encouraging ratings would have a decentralized-communication pattern that facilitates group productivity.

The characteristics of the Humanistic-Encouraging group are those essential to cooperative learning. These are the same characteristics needed to form correct, group mental models, according to R. D. Johnson (1998). The test results suggest that the Bcube process seems to have prepared the treatment group with those characteristics.

Question 10. *Will the Affiliative ratings of students who participate as a group in the Bcube module be higher than those of students who do not, with respect to scores on the Affiliative scale of the Group Styles Inventory?*

The treatment group's ratings are significantly higher than the control group's. The control group ranked in the "low" category on the Circumplex at the 24th percentile. The treatment group ranked in the "medium" category at the 61st percentile. The "effective" group ranked in the "medium" category at the 64th percentile.

Affiliative group members treat each other well, communicate openly, and genuinely feel like they are working as a team. The atmosphere is very friendly, cooperative, and relaxed. They make sure that everyone is included in the discussion and show an interest in what each member is saying. Though the group is not necessarily task-oriented, members' receptivity to each other's ideas and the open lines of communication facilitate problem solving (Human Synergistics, 1993).

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Groups with high Affiliative ratings would increase group cohesion leading to increased group productivity. These findings of high Affiliative ratings for the treatment group suggest that the Bcube process emphasis on the sharing of individual mental models promotes open communication and a friendly environment. These findings using the GSI support R. D. Johnson's (1998) claims of the intended purpose of the Bcube process.

Question 11. *Will the Approval ratings of students who participate as a group in the Bcube module be lower than those of students who do not with respect to scores on the Approval scale of the Group Styles Inventory?*

The treatment group's rankings are actually higher than the control group's. But the difference is not significant. The control group's rank on this scale is in the "medium" category at the 57th percentile. The treatment group's ranking is in the "high" category at the 76th percentile. By contrast, the "effective" group ranking is in the "medium" category at the 30th percentile.

The much higher rankings of the control and treatment groups can be attributed to being newly formed groups. Approval-seeking activities are standard for newly formed groups (Wheelan, 1994a). Approval-oriented group members are primarily concerned with being accepted and not offending one another. The members' needs for acceptance and a sense of belonging cause them to interact with one another in non-threatening, agreeable ways. But in doing so, they often overlook the task itself or see it as secondary to maintaining a non-confrontational interpersonal climate (Human Synergistics, 1993, p. 23). This seems to be an appropriate description of what occurred with both the

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treatment and control groups. The Approval ranking is the second highest of the 12 Group Styles utilized.

This suggests that the Bcube process does not eliminate this Stage I behavior. Further research may be able to determine if the Bcube process affects the amount of time and energy a group expends in these types of activities.

Question 12. *Will the Conventional ratings of students who participate as a group in the Bcube module be lower than those of students who do not with respect to scores on the Conventional scale of the Group Styles Inventory?*

The rankings of the control and treatment groups are very close on this scale. There is no significant difference between each group's rankings. They are both in the upper range of the "medium" category at the 64th percentile (control) and the 67th percentile (treatment). The "effective" group is in the lower range of the "medium" category at the 37th percentile.

Predictability and implicit pressures to conform characterize conventional groups. Members are likely to agree with one another and to minimize dissension. Members' ideas and suggestions are somewhat conservative and traditional. In Conventional groups, there are pressures for members to "fit in" or "not rock the boat" (Human Synergistics, 1993, p. 26). The Bcube process was unable to differentiate the treatment group from the control group on this scale. However, the ranking is in the acceptable range. High rankings on this scale might indicate a group's slide into a concept called "groupthink" where members of the group quickly decide on an alternative and systematically eliminate all other options without consideration. Future research should

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determine if the Bcube process affects the groupthink tendency. The findings suggest that both groups are in Stage I of group development. These are expected findings for groups in this stage according to Wheelan (1994a).

Question 13. *Will the Dependent ratings of students who participate as a group in the Bcube module be lower than those of students who do not with respect to scores on the Dependent scale of the Group Styles Inventory?*

The treatment group's ranking on this scale is higher than the control group's but the difference is not significant. This ranking is the highest of the 12 for the treatment group. The treatment group's ranking is in the "high" category at the 83rd percentile. The control group's ranking is in the upper range of the "medium" category at the 76th percentile. The "effective" group's ranking is in the lower range of the "medium" category at the 41st percentile.

Dependent groups have trouble getting "on track," finding a direction, and making things happen. This may be a reason for the treatment group's lower posttest scores than the control group's where centralized group leaders emerged very quickly to get things going.

Dependent group members may have the task skills and knowledge required to solve the problem, but they lack some of the leadership, planning, and/or interpersonal skills needed to bring together that knowledge and expertise. Goals and objectives are accepted without question or are not established at all.

This is consistent with the Stage I description of a newly formed group (Wheelan, 1994a). Group members are looking for leadership from an external authority figure.

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The group depends on that figure for guidance in this stage. However, as the group evolves to Stage II, they start to manifest more independence from the figure and start to question their directions. It should be noted, however, that students in the treatment group relied less on the authority figure present than the control group and sought to solve problems among themselves.

Question 14. *Will the Avoidance ratings of students who participate as a group in the Bcube module be lower than those of students who do not with respect to scores on the Avoidance scale of the Group Styles Inventory?*

This is the only ranking where the control group is higher than the treatment group, although not significantly. The control group's ranking is in the upper range of the "medium" category at the 74th percentile. The treatment group is in the same range of the same category. But its ranking is at the 64th percentile. The "effective" group's ranking is in the lower range of the "medium" category at the 39th percentile.

Avoidance-oriented groups are made up of people who are put together but who do not really operate as a unit or a team. Members feel that the group activity holds little promise of fulfilling their personal needs and, at worst, is potentially threatening and stressful. Communication within these groups tends to be quiet and subdued. Members are reluctant to suggest ideas or to commit to solutions (Human Synergistics, 1993, p. 32). This is the type of behavior R. D. Johnson (1998) posits that the Bcube process attempts to remedy by the exchange of individual mental models during the process of creating a group mental model. The difference is in the right direction even though it is not significant. Further research might attempt to find a way for Bcube to make a

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significant impact.

Question 15. *Will the Oppositional ratings of students who participate as a group in the Bcube module be lower than those of students who do not with respect to scores on the Oppositional scale of the Group Styles Inventory?*

The treatment-group ranking is slightly higher, but not significantly, than the control-group ranking. The control-group ranking is in the upper range of the "low" category at the 20th percentile. The treatment-group ranking is at the 27th percentile. The "effective" group is in the lower range of the "medium" category at the 39th percentile.

Confrontation, conflict, and dissension prevail in groups with a high Oppositional interaction style. Members challenge everything said by each other, look for flaws and mistakes, and (in self-defense) present only "safe" ideas that are difficult to criticize (Human Synergistics, 1993, p. 35). However, a certain amount of Oppositional thinking in a group, particularly in the form of playing the "Devil's advocate" or constructing "worse-case" scenarios, is healthy for the group's performance. This would explain why the "effective" group's profile is higher than that of either the control or treatment group.

This type of style is usually not manifested in newly formed groups unless they are people who have known each other before. Elements of Wheelan's Stage II of group development are described in this style. The findings on this style might suggest that the treatment group may have progressed farther along than the control group in the stages of group development. A high ranking would be typical of a group in Stage II (Counter-Dependency and Flight) of group development.

The direction of difference is in the right direction but not significant. This

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suggests that the Bcube process is not presently effective in achieving the suggested level of Oppostitional thinking within a group but might advance groups from Stage I to Stage II more quickly. Further study is needed to determine if this is true.

Question 16. *Will the Power ratings of students who participate as a group in the Bcube module be lower than those of students who do not with respect to scores on the Power scale of the Group Styles Inventory?*

The treatment-group rating at the 70th percentile is higher than the control group rating at the 61st percentile, but not significantly. Both ratings are in the high range of the "medium" category. The "effective" group rating is in the low range of the "medium" category at the 41st percentile.

Members of Power-oriented groups are assertive, overconfident, and arrogant. People spend their time vying for position, trying to get their way, and refusing to compromise. The overconfident, groupthink mentality in Power groups leads members to view the problem as being less difficult than it really is. Solutions are accepted, but only by those members who controlled the discussion. These same members often are later surprised to learn that their solutions were not as good as they thought they were.

These types of struggles were not apparent to the researchers as they evaluated the groups. The rankings seem to indicate that the participants felt differently whether they were in the control or treatment group. It appears from the rankings that participants sensed some power issues within their groups.

R. D. Johnson's (1998) theory for Bcube is that it will reveal people's mental models so that they can be recognized, discussed, and a consensus reached on how to

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handle what has surfaced. The rankings do not show that Bcube makes a significant difference. However, further research that allows for more than 1 hour in session could show different results.

Question 17. *Will the Competitive ratings of students who participate as a group in the Bcube module be lower than those of students who do not with respect to scores on the Competitive scale of the Group Styles Inventory?*

The rankings for the treatment group (54th percentile) and the control group (52nd percentile) are very close on this group style. The "effective" group ranking is at the 23rd percentile.

Members of groups with a Competitive style are not really interested in solving their problem and, instead, spend time selling their ideas and trying to impress one another. Observing a Competitive group is like watching a battle, and the participants often feel like they have been through one. An internally competitive spirit might be useful in certain circumstances, but it is counterproductive for group problem-solving and decision-making purposes. Members make the mistake of competing against each other rather than working as a team (Human Synergistics, 1993, p. 42). These activities are Stage II and III activities, according to Wheelan (1994a), and are not expected to be seen in the beginnings of group development.

This suggests that Bcube is not effective at differentiating groups with this characteristic. This is contrary to R. D. Johnson's (1998) theory that the Bcube experience moves groups away from competition toward cooperation, at least in the initial stage of group development.

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Question 18. *Will the Perfectionistic ratings of students who participate as a group in the Bcube module be lower than those of students who do not with respect to scores on the Perfectionistic scale of the Group Styles Inventory*?

The treatment group ranking is significantly higher than the control group ranking. The treatment-group ranking is at the 51st percentile. The control group ranking as at the 32nd percentile. The "effective" group ranking is between the treatment and control group ranking at the 39th percentile.

The Perfectionistic group makes every effort to come up with the best solution and avoid any and all mistakes. Members get hung up on the details, place too much emphasis on minor issues, and are never completely satisfied with any idea. There is an incorrect assumption made by the members that precision and perfectionism are synonymous with excellence and achievement. The members are driven by the personal need to prove themselves (Human Synergistics, 1993, p. 45). These characteristics are considered Stage III and IV activities.

The Bcube process does differentiate significantly on this characteristic but opposite to the expected direction. This suggests that Bcube increases the tendency toward perfectionism at a rate that is above the GSI norm.

Question 19. *Will the Achievement ratings of students who participate as a group in the Bcube module be higher than those of students who do not with respect to scores on the Achievement scale of the Group Styles Inventory?*

The treatment group ranking is significantly higher than the control group ranking. The treatment group ranking is at the 52nd percentile. The control group

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ranking as at the 24th percentile. The "effective" group ranking is at the 72nd percentile. It appears that the Bcube process has prepared the treatment group to perceive the need for using this style.

Achievement-oriented groups are concerned with getting things done and performing well. The group interacts in a rational way, often with a plan and a reasonably structured way of proceeding. Members set goals, discuss alternatives with the objectives in mind, and stick with the task. Because members of Achievement oriented groups view these groups as extensions of themselves, they are concerned with using the resources available within the group rather than taking over, outperforming each other, or looking good at each other's expense.

These characteristics are Stage IV activities. A group performing well in this area is considered a mature, high performance group. This supports R. D. Johnson's (1998) theory of a team with a well-accepted and shared-group mental model. These findings also suggest that there are elements of a decentralized communication pattern and group cohesion present in the treatment group.

Question 20. *Will the Self-Actualizing ratings of students who participate as a group in the Bcube module be higher than those of students who do not with respect to scores on the Self-Actualizing scale of the Group Styles Inventory?*

This is the style with the greatest disparity between treatment and control groups. The treatment-group ranking is at the 57th percentile, above the midrange of the "medium" category. The control-group ranking is at the 16th percentile. The "effective" group ranking is at the 70th percentile.

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Self-Actualizing groups tend to be optimistic, interested, and, at times, seemingly disorganized. Their members offer any idea without hesitation, show enthusiasm about new and unusual perspectives, and become engrossed in the problem and the process. Interactions within Self-Actualizing groups reflect a healthy and balanced concern for people and the task to be accomplished. Members view the experience as an opportunity to work with others on a challenging problem and develop their personal/professional skills; they typically enjoy themselves and derive satisfaction from the group process (Human Synergistics, 1993).

These characteristics are descriptive of those necessary for members of effective, cooperative, learning groups and are Stage IV activities utilized by high-performance groups. This suggests that the Bcube process is effective in differentiating on this characteristic. This is strong support for the use of Bcube in forming cooperative-learning groups.

Summary

The treatment group attained significant difference over the control group in all four of the group styles making up the Constructive cluster. The styles in the cluster are Achievement (11 o'clock), Self-Actualizing (12 o'clock), Humanistic-Encouraging (1 o'clock), and Affiliative (2 o'clock). The treatment group was significantly higher on the Perfectionistic (10 o'clock) style in the Aggressive/Defensive cluster.

The Constructive cluster styles tap the full potential of group members. Members of groups with these styles do not put themselves and their interests above the group, nor

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do they assume a position subordinate or subservient to the group. Constructive groups display an ability to produce a decision that all the members can "buy into." They have the ability to generate solutions that are generally superior to those the group members could develop independently. A high level of enjoyment and satisfaction on the part of group members is another characteristic. They have a tendency to view the group process as a way of increasing both individual and group effectiveness (Human Synergistics, 1993, p. 9).

This view of Constructive styles parallels R. D. Johnson's (1998) theory of shared mental models. The practice field is where members develop the characteristics of a group using the Constructive cluster styles. The Bcube experience is the literal "practice" field for honing the interpersonal skills necessary. Primarily, utilizing the Constructive cluster styles takes time to develop in any group and time to maintain. R. D. Johnson's (1998) metaphor is that an athletic team will spend days if not weeks preparing for a 1-hour performance.

Seeing a significant pattern of Constructive cluster style utilization by the treatment group on the GSI supports the Bcube experience as an effective preparation tool for equipping students to participate in cooperative-learning activities.

Group Development Questionnaire

Research question 4

Will the observed group effectiveness rankings and the stages of group development ratings be different for students who participate as a group in the Bcube

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module from those who do not?

The last research question for this study used the Group Development Questionnaire to collect and organize the needed data. The question is repeated here for clarity.

In an attempt to provide another view and to complement the self-report data generated by the GSI, the Group Development Questionnaire (GDQ) was incorporated into the research design. The GDQ is designed to be a self-report instrument. In this research, it is used as an observer instrument. Those items requiring introspection by the participant versus observation of the participant were omitted by the observers.

The GDQ is diagnostic by design in that it is used to show on which types of activities the group is spending its resources. The GSI is more prescriptive in its design where a group's ranking is compared to a norm to show where improvements need to be made. The GDQ showed the treatment group with higher means on all four stages of group development. The higher means indicate that the treatment group was dealing with more stage development issues than the control group. Further analysis would reveal specifically the difference between the issues in the treatment and control groups.

The effectiveness ratio was higher for the treatment group (64.3%) than the control group (56.8%). The effectiveness ratio is based on research listing the characteristics of a Stage IV group. The observers saw more of the Stage IV characteristics in the treatment group than the control group.

An interrater reliability test showed the measure of agreement between the raters to be Kappa alpha 0.631. This was lower than expected and is related to the short time period the raters had to evaluate each group, typically 20 to 30 minutes to evaluate three

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groups in the same room. The staffing shortage complicated the rating process by requiring the raters to do other functions before and after the ratings. Additional training of the raters using the modified instruments during trial runs could have been helpful.

Findings Summary

This study tested a device and series of exercises called Bcube with a group self-report on group effectiveness and the group styles utilized, a pre- and posttest on a learning module, and a qualitative observer report on group development and group effectiveness. The results show that Bcube had no overall significant effect on learning. However, the results were confounded by the selection of a task that did not require cooperative learning to be mastered. The control group had participants that devised a way to master the material on their own, then assumed leadership of the group to share their method. The task lended itself to centralized-communication patterns and domination rather than consensus and group-based patterns.

The GSI (the self-report instrument) and the GDQ (the observer report instrument) showed that the treatment group was perceived to be more effective than the control group. All four of the GSI Constructive-styles scales for the treatment group were significantly higher than for the control group. Higher scores on the constructive-styles scales are a characteristic of effective groups, according to Cooke and Lafferty (1988).

The GDQ (observer report instrument) showed the treatment group to have a higher effectiveness ratio than the control group. The higher the effectiveness ratio, the

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more characteristics of an effective group are displayed by the group being observed.

The GDQ and the GSI results both indicate that the treatment group was perceived to be more effective.

Recommendations

Implications of the Study

This study intended to investigate the use of the Bcube process in bringing together heterogenous groups. This study also was designed to assess the effect of the Bcube process on learning outcomes on a treatment group when compared to a control group.

R. D. Johnson (1998) theorizes that the Bcube process allows teams of various types to simulate group interaction in a safe, nonthreatening environment. It allows them to test, examine, and reshape these mental models in a way that helps the team to learn and be productive.

The implications suggested by the findings of this study are:

1. The Bcube process assists in forming, in a short period of time, the characteristics identified as desirable for cooperative-learning groups. The literature pointed out the social and academic benefits to the individual student and the class, in general, when effective cooperative-learning groups are put into operation. The time investment of using the Bcube process at the beginning of a term would likely pay dividends during the rest of the term.

2. The Bcube process may facilitate the formation of decentralized-

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communication patterns early in the group-formation process. Research suggests that forming decentralized-communication patterns improves group cohesiveness and productivity. Experiencing this has possible implications on students' academic performance, retention rates, and career preparation.

3. The Bcube process positively impacts the self-report ratings of group effectiveness. The treatment group perceived that they made consensus decisions, that they all benefitted from working together more than working alone, and that they were effective as a group. The implication is that participation in this type of pregroup orientation provides a chance to experience the benefits of being a part of an effective group prior to actually being expected to perform as an effective group member (teamwork before taskwork).

4. The impact of the Bcube process in all self-report areas does not appear to be affected by race or gender. The implication is that the Bcube benefits are generalizable to all groups on the Andrews University campus.

5. The Bcube process may facilitate earlier development of Stage IV characteristics in cooperative-learning groups. The implication is that in situations where the development of group cohesion is needed quickly, using the Bcube process has its advantages. In most college classes using cooperative-learning groups, an acceleration of the development of group cohesion would be beneficial.

6. In those situations where a centralized-communication pattern is preferable with the early identification of a dominant group leader, and task completion is paramount, the Bcube process would not be the best option.

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7. The treatment groups all reported that group lists of Bcube items were all more accurate than the individual lists. This suggests that there may be support for R. D. Johnson's (1998) theory that mental model change occurs when using the Bcube. More research is needed to examine exactly what is changing and why it is changing.

Suggestions for Future Study

This study is the first of the Bcube process and has limited its investigation to determining if there is effective change and, if so, by how much. However, other areas of Johnson's Bcube theory also merit investigation. They include:

1. Testing the implementation of the Bcube experience for longer than the 1 hour allowed in this study. The time was purposely limited to approximately the same time as would be allowed for one class period. This may not be the best use of the Bcube experience.

2. Testing the longitudinal effects of the Bcube experience over time, i.e., a semester/term or a school year. There is research pro and con to the long-term effects of teamwork training.

3. Testing what mental models change and when they change as a result of the Bcube intervention. A great deal of mental-model theory appears in the literature and some tests of those theories. However, R. D. Johnson's (1998) theory has not been tested in this area.

4. Doing some replication studies to see if the same results would occur with male versus female pretest/posttest performance.

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5. Doing some replication studies to see if the same results would occur with Blacks (Black males especially), and to determine why they occur.

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APPENDIX

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APPENDIX A

CONCEPTUAL MAP

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Conceptual Map

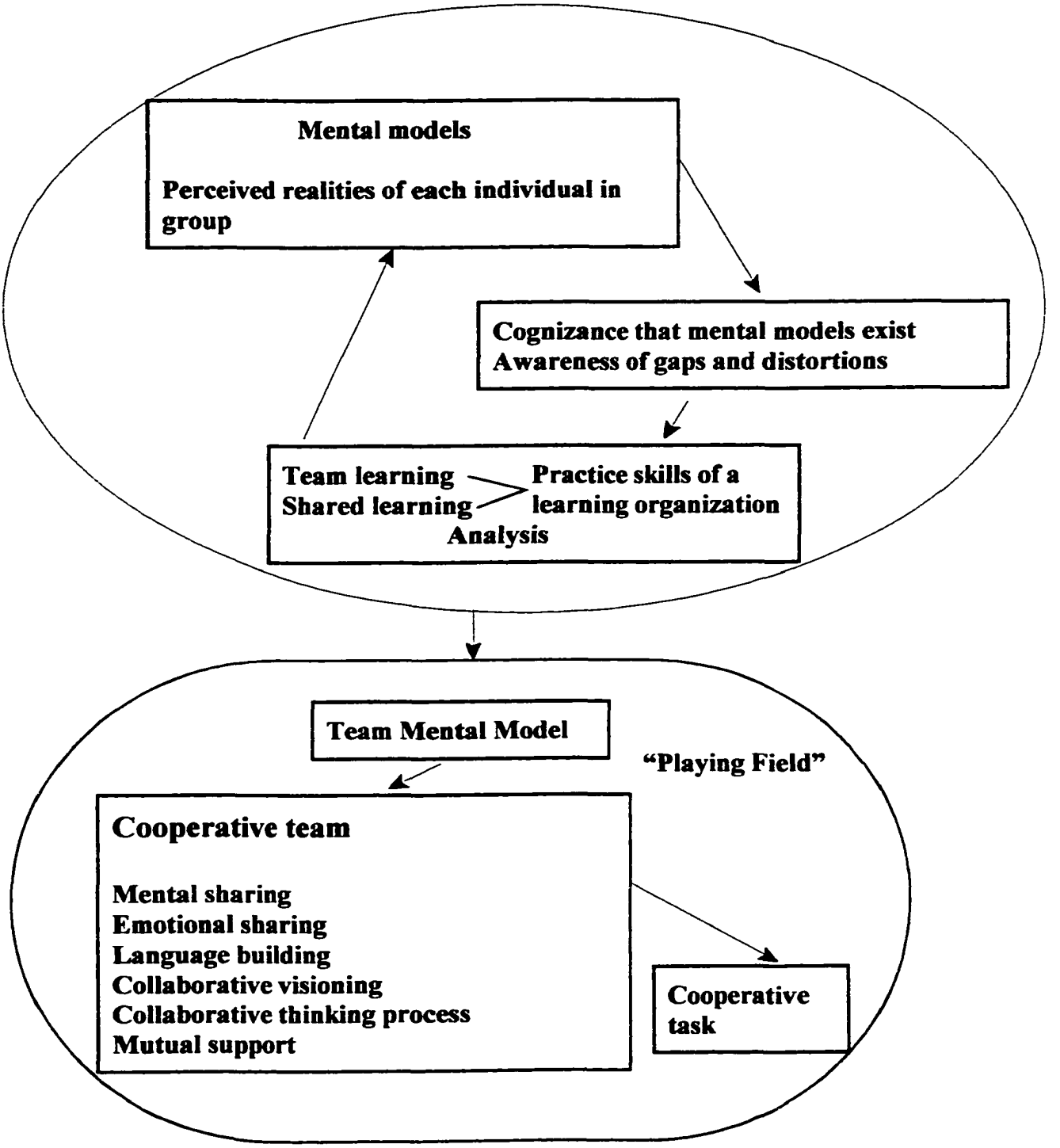

Figure 5. Bcube conceptual map.

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APPENDIX B

SAMPLE DEMOGRAPHIC LIST AND CHARTS

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Table 44

List of Participant Academic Majors

MAJOR	Frequency	Percent
Art	1	1.6
Aviation	2	3.2
Biology	2	3.2
BS	1	1.6
BSN	1	1.6
BSN Nurse	1	1.6
Business	2	3.2
Comm. Counseling	1	1.6
Communication	2	3.2
ComputerSystems	2	3.2
Dev Psych	1	1.6
DigitalMedia	2	3.2
Education	1	1.6
ElemEducatio	1	1.6
Eng/Journalism	1	1.6
English	1	1.6
English Lit	1	1.6
French	1	1.6
GraphicDesign	1	1.6
HCAdministra	1	1.6
HealthScience	1	1.6
History	1	1.6
Horticulture	1	1.6
Journalism	1	1.6
MA/Biology	1	1.6
MA/Divinity	1	1.6
Math/teacher	1	1.6
Med Tech	2	3.2
Music Perf	1	1.6
Music/Comput	1	1.6
None listed	1	1.6
None Listed	1	1.6
Nursing	4	6.3
Phy Therapy	1	1.6
Phys Therapy	1	1.6
PhysicalTher	1	1.6
PhysicalTher	1	1.6
Physics	1	1.6
PreLaw/Hist	1	1.6
Psychology	3	4.8
Relig/Bus	1	1.6
Religion	1	1.6
Social Work	1	1.6
Speech Path	1	1.6

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Table 44—*Continued*

Staff	1	1.6
Theo/Journl	1	1.6
Theolo/Psych	1	1.6
Theology	1	1.6
Undecided	2	3.2
Undeclared	1	1.6
Total	63	100.0

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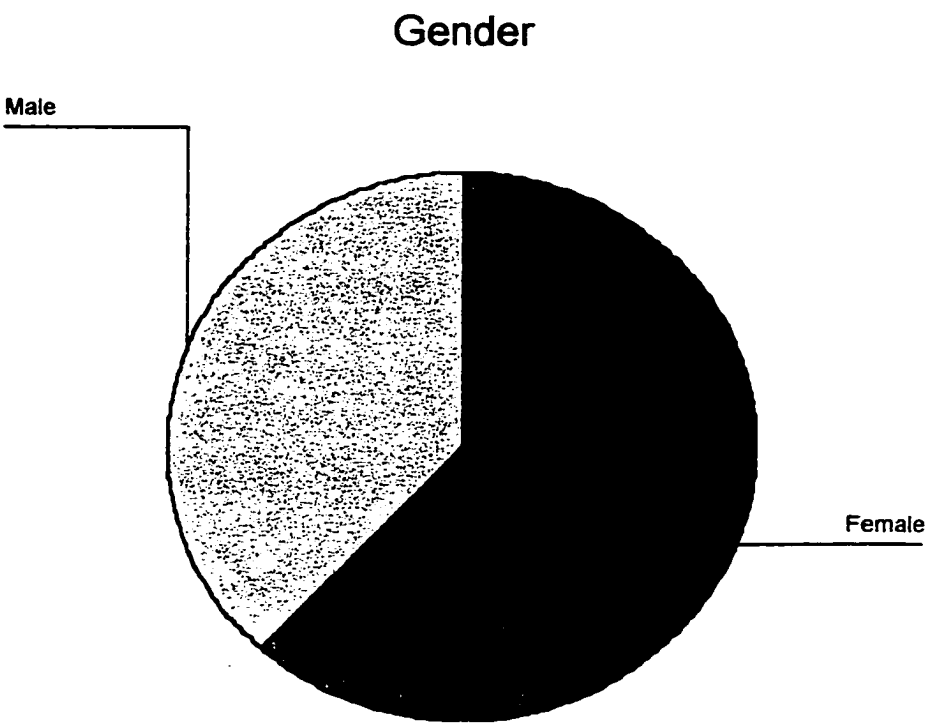

Figure 6. Gender breakdown of participants.

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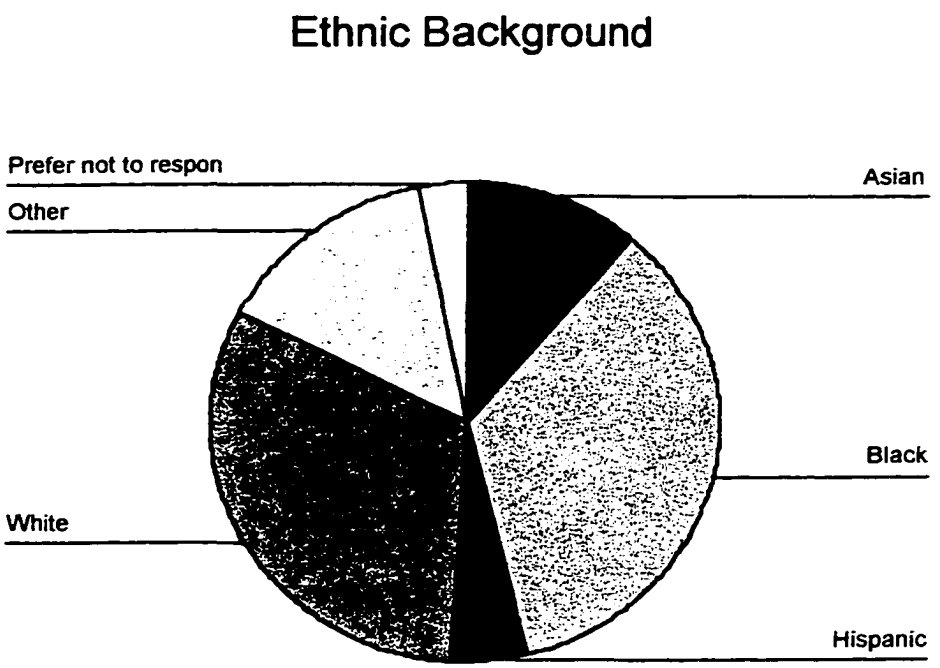

Figure 7. Ethnic backgrounds of participants.

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Table 45

Ethnic Frequency by Group

	Female			Male			
	Black	White	Other	Black	White	Other	Group Totals
Treatment Group 1	2	1	1	2	0	1	7
Treatment Group 2	2	1	1	1	1	1	7
Control Group 3	2	0	2	0	0	1	5
Control Group 4	2	0	2	1	0	0	5
Control Group 5	2	0	2	0	0	0	4
Treatment Group 6	1	2	1	0	1	1	6
Control Group 7	1	1	1	0	0	3	6
Treatment Group 8	2	1	0	2	1	0	6
Control Group 9	0	1	2	0	3	1	7
Treatment Group 10	1	2	0	1	0	1	5
Control Group 11	2	1	0	0	2	0	5
	17	10	12	7	8	9	63
Gender Totals			39			24	

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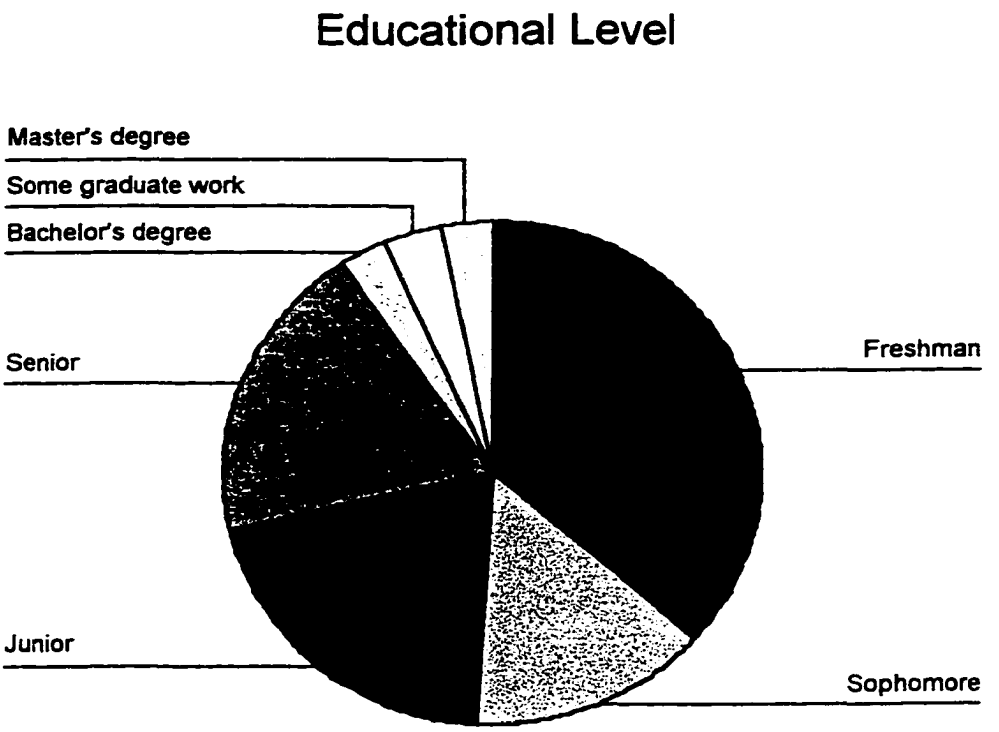

Figure 8. Participant education levels.

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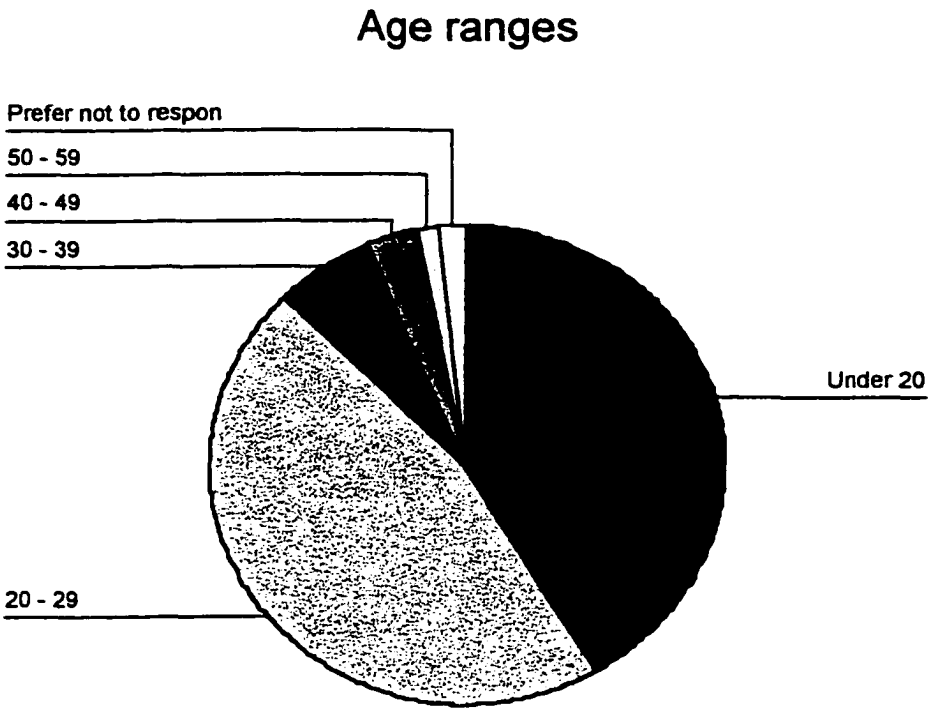

Figure 9. Age ranges of participants.

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APPENDIX C

PARTICIPANT HANDOUTS

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Consent Form

Cooperative Learning Teams Treatment Research

In signing this from, I am giving my consent to participate in a treatment research project conducted by C. Vincent Anderson, an educational psychologist doctoral candidate at Andrews University, Department of Educational and Counseling Psychology in Berrien Springs, Michigan.

I understand that I will be part of a research study that will test the effectiveness of a specific cooperative learning strategy on a sample of Andrews University students. The research will be conducted on the campus of Andrews University.

I certify by my signature below that I am 18 years or older.

I understand the study will involve my participation in one session of approximately two hours using cooperative learning techniques during the months of September to December, 1999.

I understand that cooperative learning techniques require significant interpersonal interactions with members of my assigned group. This group sessions will be facilitated by a trained researcher to limit any risk. Physical, social, and psychological risks from participation in this study do not exceed the risks associated with being a student at Andrews University at this time.

I understand that the potential benefits for me as a participant and other students will be improved methods of cooperative learning employed by faculty.

I understand the study will require that I complete questionnaires at the beginning and the end of the session.

I understand that after the completion of the sessions and the return of all questionnaires, I will be paid $10 for my efforts.

I understand that any information obtained in this study is for research only and that privacy and confidentiality will be maintained by using only the last four digits of my social security number and the first letter of my last name.

I understand that I have no obligation to participate in this study and can withdraw at any time I so choose. I understand that there will be no academic, financial, or social consequences that will result from withdrawing from the study if I choose to do so.

I understand that I have the right to be informed about the research, the outcomes and/or the conclusions by contacting Vincent Anderson at 7176 Maple Grove Road, Berrien Center, MI 49102. 616-461-3870. The advisor for this project is Dr. Elsie Jackson, Chair of the Department of Educational and Counseling Psychology at Andrews University. She can be reached at 616-471-3200 or by dialing the main university number 616-471-7771. Her mailing

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address is Andrews University, Berrien Springs, MI 49104.

I certify by my signature below that I have had all of my questions satisfactorily answered prior to participating in this study.

Signature _____ Date: _____

Investigator's Signature: _____

Witness' Signature: _____

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Study Material for Learning Module

How to interpret arterial blood gases.

Acid-base balance and oxygenation are important processes in maintaining homeostasis in the body. Arterial blood gases, drawn from arteries, are used to determine acid-base status and level of oxygen available to the body. Interpreting blood gases accurately is important to determine the kind of care a patient needs.

Normal blood gases have

pH 7.35-7.45	This determines acid-base status in the body.
PCO2 (pressure of carbon dioxide) 35-45	This assists in determining respiratory status.
HCO3 (bicarbonate) 22-26	This assists in determining metabolic status.
PO2 (pressure of oxygen) greater than 70	This determines amount of oxygen available to body.

Acidosis exists if the pH is **less** than 7.35

Alkalosis exists if the pH is **greater** than 7.45

Respiratory acidosis exists if the pH is less than 7.35 **and the pCO2 is more** than 45

Respiratory alkalosis exists if the pH is greater than 7.45 **and the pCO2 is less** than 35

Metabolic acidosis exists if the pH is less than 7.35 **and the HOC3 is less** than 17

Metabolic alkalosis exists if the pH is greater than 7.45 **and the HCO3 is more** than 26

Hypoxemia (decreased oxygen in the blood) exists if the pO2 is less than 70.

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Here are 3 steps to help interpret blood gases.

1. Look at the pH. Determine if acidosis (pH less than 7.35) or alkalosis (pH greater than 7.45) exists.
2. Label the acidosis or alkalosis as respiratory (look at the pCO2) or metabolic (look at the HCO3). It is always necessary to look at BOTH pCO2 and HCO3 to determine respiratory or metabolic state as these will attempt to compensate each other to restore homeostasis.
3. Determine if hypoxemia exists by looking at the pO2 (pO2 less than 70 indicates hypoxemia).

Here are samples for practice:

pH 7.30 pCO2 50 HCO3 25 pO2 80	pH 7.30 less than 7.35 - acidosis PCO2 50 greater than 45 respiratory HCO3 25 - normal PO2 80 - normal Interpretation- respiratory acidosis
pH 7.30 pCO2 40 HCO3 17 pO2 80	pH less than 7.35 - acidosis PCO2 40 - normal HCO3 17 -less than 22 - metabolic component PO2 80 - normal Interpretation - metabolic acidosis
pH 7.37 pCO2 39 HCO3 24 pO2 68	pH - normal PCO2 - normal HCO3 - normal PO2 - less than 70 hypoxemia Interpretation - hypoxemia
You try these	
pH 7.48pCO2 30 HCO3 22 pO2 72	Respiratory alkalosis - why?
pH 7.50 pCO2 35 HCO3 36 pO2 80	Metabolic alkalosis - why?

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Learning Module Pretest

SSN (last 4 + alpha): _____

Class Standing: freshman sophomore junior senior

Have you ever had a course in Pathophysiology: Yes No

This is a test to see how well you interpret arterial blood gases.
INSTRUCTIONS: Classify the following blood gas readings according to items 1 - 6 below. Here are the numbered choices:

"1" respiratory acidosis
"2" respiratory alkalosis
"3" metabolic acidosis
"4" metabolic alkalosis
"5" hypoxemia
"6" normal blood gas

If you don't know the answer, you may leave it blank.

Write your answer here ➘

1.	**PH**	7.30	**PC02**	50	**PO2**	80	**HC03**	25	
2.	**PH**	7.30	**PC02**	35	**PO2**	90	**HC03**	17	
3.	**PH**	7.45	**PC02**	35	**PO2**	68	**HC03**	24	
4.	**PH**	7.48	**PC02**	33	**PO2**	75	**HC03**	23	
5.	**PH**	7.40	**PC02**	42	**PO2**	100	**HC03**	24	
6.	**PH**	7.51	**PC02**	40	**PO2**	93	**HC03**	30	
7.	**PH**	7.55	**PC02**	36	**PO2**	70	**HC03**	34	
8.	**PH**	7.16	**PC02**	35	**PO2**	91	**HC03**	16	
9.	**PH**	7.16	**PC02**	61	**PO2**	86	**HC03**	22	
10.	**PH**	7.39	**PC02**	36	**PO2**	59	**HC03**	23	
11.	**PH**	7.43	**PC02**	42	**PO2**	91	**HC03**	26	
12.	**PH**	7.50	**PC02**	30	**PO2**	82	**HC03**	22	
13.	**PH**	7.50	**PC02**	35	**PO2**	94	**HC03**	29	
14.	**PH**	7.47	**PC02**	36	**PO2**	98	**HC03**	28	
15.	**PH**	7.31	**PC02**	49	**PO2**	88	**HC03**	24	

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Learning Module Posttest

Academic Major: _____

Class Standing: freshman sophomore junior senior

Have you ever had a course in Pathophysiology: Yes No

This is a test to see how well you interpret arterial blood gases.

INSTRUCTIONS: Classify the following blood gas readings according to items 1 - 6 below. Here are the numbered choices:

"1" respiratory acidosis
"2" respiratory alkalosis
"3" metabolic acidosis
"4" metabolic alkalosis
"5" hypoxemia
"6" normal blood gas

If you don't know the answer, you may leave it blank.

Write your answer here

1.	**PH**	7.39	**PC02**	39	**PO2**	84	**HC03**	23	
2.	**PH**	7.28	**PC02**	60	**PO2**	80	**HC03**	22	
3.	**PH**	7.40	**PC02**	40	**PO2**	69	**HC03**	24	
4.	**PH**	7.53	**PC02**	25	**PO2**	91	**HC03**	25	
5.	**PH**	7.60	**PC02**	35	**PO2**	84	**HC03**	34	
6.	**PH**	7.29	**PC02**	49	**PO2**	71	**HC03**	25	
7.	**PH**	7.02	**PC02**	35	**PO2**	77	**HC03**	17	
8.	**PH**	7.41	**PC02**	39	**PO2**	91	**HC03**	23	
9.	**PH**	7.47	**PC02**	45	**PO2**	85	**HC03**	29	
10.	**PH**	7.34	**PC02**	48	**PO2**	85	**HC03**	25	
11.	**PH**	6.84	**PC02**	40	**PO2**	112	**HC03**	10	
12.	**PH**	7.60	**PC02**	20	**PO2**	100	**HC03**	22	
13.	**PH**	7.15	**PC02**	62	**PO2**	90	**HC03**	22	
14.	**PH**	7.57	**PC02**	37	**PO2**	76	**HC03**	32	
15.	**PH**	7.44	**PC02**	36	**PO2**	82	**HC03**	23	

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APPENDIX D

RECRUITMENT MATERIALS

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Help!!!

February 8, 2000

Dear Andrews University Faculty:

I need your help!
I am conducting a research project on **Monday evening, February 21, 2000, at 6:30pm in Room 183 of Bell Hall.**
My project involves evaluating a cooperative learning method and will involve people working in groups and reporting on the experience. **I need a diverse group of approximately 45 students (graduate and undergraduate) to participate in the project.**
I am paying $10 to each person who participates.
The project will last for two (2) hours; **but all participants must be present before the start of the project.**
Please share this opportunity with the students in your classes.
To register to participate, students should call 461-3870 and leave a name and telephone number; or using email: cvander@andrews.edu.
Dr. Elsie Jackson is the chairperson of the committee monitoring and evaluating this research project.

Thanks so much for sharing this information with your students.
Sincerely

C. Vincent Anderson
Educational Psychology doctoral candidate.
Andrews University
Berrien Springs, MI.

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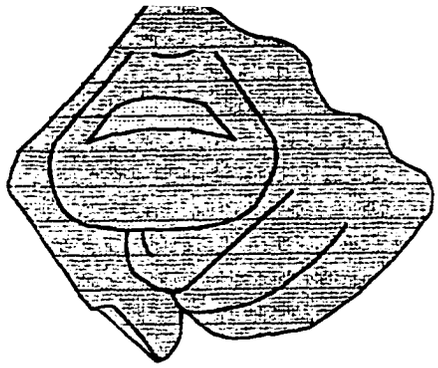

I NEED YOU for a Cooperative Learning Research Project Monday 2/21/2000 6:15pm Room 183 Bell Hall Each participant receives $10

Call Vincent Anderson at 461-3753 for more information or just be there early.

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Andrews study paying students

A study of cooperative learning is paying Andrews students $10 to participate on Thursday(10/21/99) at 7 pm in Bell Hall, Room 181. The research study is being conducted by Vincent Anderson, an Educational Psychology doctoral candidate and a contract instructor at Andrews.

"My project involves evaluating a cooperative learning strategy and will involve people working in groups and reporting on the experience. I need approximately 45 students to participate in the project."

Anderson is paying students $10 each to participate in his project that he says will last approximately 2 hours. The experiment will take place in Bell Hall in room 181. Registration starts at 6:45 pm.

Reservations can be made by email: cvander@andrews.edu; or phone: 461-3870.

"If you bring enough friends, you could have a serious party (or whatever) on my money," says Anderson.

Additional Information

Contact: Vincent Anderson
Email: cvander@andrews.edu
Phone: 616-461-3870

Other News

Andrews study paying students
Earn $10 by participating in a cooperative study.

Exhibit Portrays Holocaust Courage
"What Every Decent Human Being Should Do"

Attention photographers!

AU Wind Symphony Europe Tour
Wind Symphony asks for help in planning Europe tour.

Other Events

J.C. Mattingly To Sign Copies of Newly Released Book

New Employee Orientation Slated for Thursday

Exploring Basic Library Resources Workshop
The second in a series of technology education workshops from James White Library.

President's Circle Concert

Open House Scheduled to Celebrate Completion of Airpark Hangar

VOP's Morris Venden to Speak at Seminary

Exploring Web Databases Workshop
Part of the continuing series of technology education workshops from James White Library.

Berrien Springs Blood Drive

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Dear Andrews students

Here is a quick way to get that next pizza!

I am conducting my research project for my dissertation on Thursday evening,October 21, 1999, at 7pm in Room 181 of Bell Hall.
My project involves evaluating a method of cooperative education and will involve people working in groups and reporting on the experience. I need approximately 45 students to participate in the project. I am paying $10 to each person who participates. The project will last for approximately two (2) hours; **but all participants must be present before the start of the project.**
If anyone is interested, they can call 461-3870 and leave their name and telephone number to reserve a spot. You can also show up before 7:00pm at Room 181 Bell Hall(across from the computer lab).
Dr. Elsie Jackson is the chairperson of the committee monitoring and evaluating this research project.

If you bring friends, you could have a serious party this weekend.

Be there tomorrow before 7:00 pm.

Thanks

C. Vincent Anderson
Educational Psychology doctoral candidate.
Andrews University
Berrien Springs, MI.

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REFERENCE LIST

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REFERENCE LIST

Allport, G. (1954). *The nature of prejudice.* Cambridge, MA:Addison-Wesley.

Association of American Colleges. (1985). "Integrity in the Curriculum: A report to the Academic Community." Project on redefining the meaning and purpose of baccalaureate degrees. Washington, D.C.: Author. ED 251059.

Babad, E. Y., & Amir, L. (1978). Bennis and Shepard's theory of group development: An empirical examination. *Small Group Behavior, 9,* 477- 492.

Baker, A. C., & Jensen, P. J. (1997). In conversation: Transforming experience into learning. *Simulation & Gaming, 28,* 6-12.

Balcazar, F. E., Hopkins, B. L., & Suarez, Y. (1986). A critical, objective review of performance feedback. *Journal of Organizational Behavior Management, 7*(3-4), 65-89.

Bales, R. F. (1950). *Interaction process analysis: A method for the study of small groups.* Chicago: University of Chicago Press.

Barr, P. S. Stempert, J. L., & Huff, A. S. (1992). Cognitive change, strategic organizational renewal. *Strategic Management Journal, 13,* 15-36.

Barr, S. H., & Conlon, E. J. (1994). Effects of distribution of feedback in work groups. *Academy of Management Journal, 37,* 614-655.

Bass, B. M., & Vaughn, J. A. (1966). *Training in industry: The management of learning.* Belmont, CA: Wadsworth Publishing.

Bavelas, A. (1950). Communication patterns in task-oriented groups. *Journal of Acoustical Society, 22,* 725-730.

Bennis, W., & Shepard, H. (1956). A theory of group development. *Human Relations, 9,* 415- 437.

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Bernthal, P. R., & Insko, C. A. (1993). Cohesiveness without groupthink: The interactive effects of social and task cohesion. *Group and Organization Management, 18,* 66-87.

Bion, W. (1961). *Experiences in groups.* New York: Basic Books.

Blumenfeld, P. C., Puro, P., & Mergendoller, J. (1992). *Translating motivation into thoughtfulness: Redefining student learning.* Norwood, NJ: H.H. Marshall.

Bok, E. L. (1986). *Higher learning.* Cambridge, Mass.: Harvard Univ. Press.

Boyer, E. L. (1987). *College: The undergraduate experience in America. New York: Harper & Row.*

Braaten, L. J. (1975). Developmental phases of encounter groups: A critical review of models and a new proposal. *Interpersonal Development, 75,* 112-129.

Brown, T., & Miller, C. (2000). Communication networks in task-performing groups. *Small Group Research, 31,* 131-137.

Byrne, E. T. (1979). *Who benefits most from participation in business policy simulations: An empirical study of skill development by functional area; Insight into experiential pedagogy.* Arizona State University, Tempe, AZ.

Caple, R. (1978). The sequential stage of group development. *Small Group Behavior, 9,* 470- 476.

Caplow, T. (1983). *Managing an organization.* New York: Holt, Rinehart, & Winston.

Carron, A.V., Widmeyer, W. N., & Brawley, L. R. (1985). The development of an instrument to assess cohesion in sport teams: The Group Environment Questionnaire. *Journal of Sport Psychology, 7,* 244-266.

Certo, S. C. (1976). The experiential exercise situation: A comment on instructional role and pedagogy evaluation. *Academy of Management Review, 1*(3),113-116.

Cohen, A. M. (1962). Changing small group communication networks. *Administrative Science Quarterly, 6,* 443- 462.

Cohen, E. G., & Lotan, R. A. (1997). *Working for equality in heterogeneous classrooms: Sociological theory in practice.* New York: Teachers College Press.

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Cooke, R. A., & Lafferty, J. C. (1988). *Group Styles Inventory.* Plymouth, MI: Human Synergistics.

Cooke, R. A., & Lafferty, J. C. (1993). *Group Styles Inventory* [test booklet]. Plymouth, MI: Human Synergistics International.

Cooke, R. A., & Szumal, J. L. (1992). *Validity of the Group Styles Inventory with respect to solution quality and acceptance criteria.* Chicago, IL: Department of Management, University of Illinois at Chicago.

Cooke, R. A., & Szumal, J. L. (1994). The impact of group interaction styles on problem-solving effectiveness. *Journal of Applied Behavioral Science, 30*(4), 415- 437.

The Cooperative Learning Center at the University of Minnesota (2001). *The history of cooperative learning* [newsletter]. Retrieved April 18, 2001 from the World Wide Web: http://www.clcrc.com/pages/CLandD.html#hist

Crain, R., Mahard, R., & Narot, R. (1982). *Making desegregation work.* Cambridge, MA: Ballinger.

DeBattista, R. A. (1986). *Using a business simulation in the principles of management course-learning outcomes and perceptions: Developments in business simulation and experiential exercises.* Stillwater, OK: Oklahoma State University.

DeNisi, A. S., Randolph, W., & Blencoe, A. G. (1982). Level and source of feedback as determinants of feedback effectiveness. *Academy of Management Proceedings, 14,*175-179.

Dewey, J. (1900). The school and society. In *The child and the curriculum: The school and society.* Chicago: University of Chicago Press, 1990.

Dewey, J. (1933). *How we think.* Boston: Health and Company.

Dill, W. R. (1961). What management games do best. *Business Horizons, 4*(3), 55-64.

Druckman, B., & Bjork R. (1994). *Learning, remembering, believing: Enhancing human performance.* Washington, DC: National Academy Press.

Dunphy, D. (1964). *Social change in self-analytic groups.* Cambridge: Harvard University.

Dunphy, D. C. (1974). The function of fantasy in groups. In G. S. Gibbard et al. (Eds.), *Analysis of groups.* San Francisco, CA: Jossey-Bass.

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Evans, N., & Jarvis, D. (1986). The group attitude scales: A measure of attraction to group. *Small group Behavior, 17*(2), 203-216.

Felder, R. M., & Brent, R. (1994). *Cooperative learning in technical courses: Procedures, pitfalls, and payoffs.* (ERIC Document Reproduction Service No. ED 377 038: 20)

Festinger, A. (1950). Informal social communication. *Psychological Review, 57*, 271-282.

Gagne, R. M. (1985). *The conditions of learning and theory of instruction.* New York: Holt: Rinehart and Winston.

Glazer, R., Steckel, J. H., & Winer, R. S. (1987). Group process and decision performance in a simulated marketing environment. *Journal of Business Research, 15*, 545-557.

Guzzo, P. A., Jackson, S. E., & Katzell, R. A. (1987). Meta-analysis analysis. *Research in Organizational Behavior, 9*, 407- 442.

Hare, A. P. (1976). *Handbook of small group research.* New York: Free Press.

Hill, W. F. (Ed.). (1974). *Systematic group development-SDG Therapy: The group as an agent of change.* New York: Behavioral Publications.

Hirokawa, R. Y. (1980). A comparative analysis of communication patterns within effective and ineffective decision-making groups. *Communication Monographs, 47*, 312-321.

Hogan, R. (1975). Theoretical egotism and the problem of compliance. *American Psychologist, 30*, 533-539.

Hothersall, D. (1995). *The history of psychology.* New York: McGraw-Hill.

Human Synergistics. (1993). *Group styles inventory participant guide.* Plymouth, MI: Author.

Human Synergistics. (1995). *Cascades survival situation leader's guide.* Plymouth, MI: Author.

Janis, I. L. (1982). *Victims of groupthink* (2nd ed.). Boston: Houghton Mifflin.

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Johnson, D. W., & Johnson, R. (1989). *Cooperation and competition: Theory and research.* Edina, MN: Interaction Book Company.

Johnson, D. W., & Johnson, R. (1991). Cooperative learning and classroom and school climate. In B. Fraser & H. Walberg (Eds.). *Educational environments: Evaluation, antecedents and consequences* (pp. 55 - 74). New York: Pergamon Press.

Johnson, D. W., & Johnson, R. (1994). *Leading the cooperative school* (2nd ed.). Edina, MN: Interaction Book Company.

Johnson, D. W., & Johnson, R. (1995). *Teaching students to be peacemakers* (3rd ed.). Edina, MN: Interaction Book Company.

Johnson, D. W., & Johnson, R. (1997). *Learning to lead teams: Developing leadership skills.* Edina, MN: Interaction Book Company.

Johnson, D. W., & Johnson, R. (2000). *Teaching students to be peacemakers: Results of twelve years of research.* Minneapolis: The Cooperative Learning Center at the University of Minnesota. Retrieved April 18, 2001, from the World Wide Web: http://www.clcrc.com/pages/peace-meta.html

Johnson, D. W., Johnson, R., & Smith, K. (1998). *Active learning: Cooperation in the college classroom.* Edina, MN: Interaction Book Company.

Johnson, D. W., Johnson, R., & Smith, K. (2000). Cooperative learning returns to college: What evidence is there that it works? *Change, 30,* 27-35.

Johnson, D. W., Maruyama, G., Johnson, R., Nelson, D., & Skon, L. (1981). Effects of cooperative, competitive and individualistic goal structures on achievement: A meta-analysis. *Psychological Bulletin, 89,* 47-62.

Johnson, R. D. (1998). *A touch of reality: An innovative, systems approach to team dynamics and organizational paradigms.* Greensboro, NC: Oakhill Press.

Johnson-Laird, P. N. (1983). *Mental models: Towards a cognitive science of language, inference, and conscience.* Cambridge, MA: Harvard University Press.

Jones, K. (1998). Simulation: Reading for action. *Simulation & Gaming, 29,* 326-330.

Jones, S. D., Buerkle, M., Hall, A., & Rupps, L. (1993). Work group performance measurement and feedback. *Group and Organization Management, 18,* 269-291.

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Kagan, S. (1994). *Cooperative learning.* San Clemente, CA: Kagan Cooperative Learning.

Kano, S. (1971). Task characteristics and network. *Journal of Educational Psychology, 10,* 55-66.

Kernaghan, J. A., & Cooke, R. A. (1987). The relationship of group process factors to the quality and acceptance of group output. *International Journal of Small Group Research,* 39-60.

Keys, J. B. (1977). The management of learning grid for management development. *Academy of Management Review, 2*(2), 289-297.

Keys, J. B. (1989). The management of learning grid for management development revisited. *Journal of Management Development, 8*(2), 5-12.

Keys, B., & Wolfe, J. (1990). The role of management games and simulations in education and research. *Journal of Management, 16*(2), 307-336.

Kinnear, T. G., & Klammer, S. K. (1987). Management perspectives: The GE experience and beyond. *Journal of Business Research, 15,* 491-501.

Lant, T. K. (1989). *Simulation games: A research method for studying organizational behavior.* Unpublished manuscript, New York University.

Lant, T. K., & Montgomery, D. B. (1987). Learning from strategic success and failure. *Journal of Business Research, 15,* 503-518.

Lant, T. K., & Montgomery, D. B. (1989). *A note on MARKSTRAT as a strategy research environment.* Unpublished manuscript, New York University.

Lawson, E. D. (1965). Change in communication networks, performance and morale. *Human Relations, 18,* 139-147.

Leavitt, H. J. (1951). Some effects of certain communication patterns on group performance. *Journal of Abnormal and Social Psychology, 46,* 38-50.

Lucas, H. C. (1979). Performance in a complex management game. *Simulation & Games, 10* (1),61-74.

Lundgren, D., & Knight, D. (1978). Sequential stages of development in sensitivity training groups. *Journal of Applied Behavioral Science, 14,* 204-222.

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Marzano, R.J., & Pickering, D.J. (1997). *Dimensions of learning: Teacher's manual* (2nd ed.). Aurora, CO: Mid-continent Regional Educational Laboratory.

McGrath, J. E. (1982). *The study of research choices and dilemmas: Judgment calls in research.* Beverly Hills, CA: Sage.

McGrath, J. E. (1984). *Groups: Interaction and performance.* Englewood Cliffs, NJ: Prentice-Hall.

McKenney, J. L. (1967). *Simulation gaming for management development.* Boston, MA: Harvard College.

McLemore, S. D., & Romo, H. D. (1998). *Racial and ethnic relations in America.* Boston, MA: Harvard College.

Meese, J. L., Blumenfeld, P. C., & Hoyle, R. (1988). Student's goal orientation and cognitive engagement in classroom activities. *Journal of Educational Psychology, 80,* 514-523.

Mesch, D., Farh, Y., & Podsakoff, P. M. (1994). Effects of feedback sign on group goalsetting, strategies, and performance. *Group and Organizational Management, 19,* 303-333.

Michealsen, L. K., Fink, L. D., & Knight, A. (Eds.). (1997). *Designing effective group activities to improve the academy.* Stillwater, OK: New Forums Press.

Mills, T. (1964). *Group transformations: An analysis of a learning group.* Englewood Cliffs, NJ: Prentice Hall.

Nadler, D. A. (1979). The effects of feedback on task group behavior: A review of the experimental research. *Organizational Behavior and Human Decision Processes, 23*(3),309-338.

Nadler, D. A., Comman, C., & Mirvis, J. L. (1980). The effects of feedback on task group behavior: A review of the experimental research. *Organizational Behavior and Human Performance, 23,* 309-338.

National Institute of Education. (1984). *Involvement in learning.* Washington, D.C.: Author. ED246 833. 127. MF-01; PC-06.

Nees, D. B. (1983). Simulation: A contemporary method for research on strategic decision-making processes. *Strategic Management Journal, 4,* 175-185.

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Nixon, H. L. (Ed.). (1979). *Group processes: A developmental perspective.* Boston, MA: Allyn & Bacon.

Oakes, J., & Wells, A. (1995). *Beyond sorting and stratification: Creating alternatives to tracking in racially mixed secondary school.* San Francisco, CA: American Educational Research Association.

Parsons, T. (Ed.). (1961). *An outline of the social system: Theories of society.* New York: Free Press.

Perkins, D. N., & Simmons, R. (1988). Patterns of misunderstandings: An integrative model for science, math, and programming. *Review of Educational Research, 58,* 303-326.

Pritchard, R. D., Jones, S., Roth, P., Stuebing, K. & Ekeberg, S. (1988). Effects of group feedback, goal setting, and incentives on organizational productivity. *Journal of Applied Psychology, 73,* (2), 337-358.

Richards, R. L., Burlingame, G. M., & Fuhriman, A. (1990). Time-limited group therapy. *Counseling Psychologist, 18*(1), 93-118.

Rogers, C. (1970). *Carl Rogers on encounter groups.* New York: Harper & Row.

Rowland, K. M., & Gardner, D. M. (1973). The uses of business gaming in education and laboratory research. *Decision Science, 4*(2), 268-283.

Sampson, E. E. (1989). The debate on individualism: Indigenous psychologies of the individual and their role in personal and societal functioning. *American Psychologist, 43,* 15-22.

Schaible, T. D., & Jacobs, A. (1975). Feedback III: Sequence effects, enhancement of feedback acceptance. *Small Group Behavior, 6,* 151-173.

Scheffe, H. (1959). *The analysis of variance.* New York: John Wiley & Sons.

Schein, E. H. (1980). *Organizational psychology.* Englewood Cliffs, NJ: Prentice Hall.

Schutz, W. C. (1966). *The interpersonal underworld.* Palo Alto, CA: Science and Behavior Books.

Seeger, J. A. (1983). No innate phases in group problem solving. *Academy of Management Review, 8,* 683-689.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Seers, A., & Woodruff, S. (1997). Temporal pacing in task forces: Group development or deadline pressure. *Journal of Management, 23*(2),169.

Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization.* New York: Doubleday.

Sharan, S. E. (1994). *Handbook of cooperative learning methods.* Westport, CT: Greenwood Press.

Shaw, M. E. (1954). Some effects of unequal distribution of information upon group performance in various communication nets. *Journal of Abnormal and Social Psychology, 49,* 547-553.

Slater, P. (1966). *Microcosm.* New York: John Wiley.

Slavin, R. E. (1983). When does cooperative learning increase student achievement? *Psychological Bulletin, 94,* 429- 445.

Slavin, R. E. (1991). Synthesis of research on cooperative learning. *Educational Leadership, 48,* 71-82.

Slavin, R. E. (1995a). *Cooperative learning: Theory, research, and practice.* Boston, MA: Allyn & Bacon.

Slavin, R. E. (Ed.). (1995b). *Cooperative learning and student diversity: Handbook of research on multicultural education.* New York: MacMillan.

Slavin, R. E., & Fashola, O. S. (1998). *Show me the evidence.* Thousand Oaks, CA: Corwin Press.

Slavin, R. E., & Cooper, R. (1999). Improving intergroup relations: Lessons learned from cooperative learning programs. *Journal of Social Issues, 55*(4), 647-663.

Sorrentino, R. M., & Sheppard, B. H. (1978). Effects of affiliation-related motives on swimmers in individual versus group competition. *Journal of Personality and Social Psychology, 36,* 704-714.

Spitz, H., & Sadock, B. J. (1973). Small interactional groups in the psychiatric training of graduate nursing students. *Journal of Nursing Education, 12,* 6-13.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Spooner, S. H. (1996). *Adoption of shared leadership management and health care employees' mental models.* University of South Dakota: Division of Counseling and Psychology in Education.

St. Germain, M., & Leveualt, D. (1997). Factors of success of simulations and games: A systemic approach to the evaluation of an organization's impact on the user. *Simulation & Gaming, 28,* 317-336.

Stevens, R. J., & Slavin, R. E. (1995). The cooperative elementary school: Effects on students' achievement, attitudes, and social relations. *American Educational Research Journal, 32,* 321-351.

Stodgill, R. M., (1972). Group productivity, drive and cohesiveness. *Organizational Behavior and Human Performance, 8,* 26- 43.

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches.* Thousand Oaks, CA: Sage.

Task Group on General Education. (1988). *A new vitality in general education. Planning, teaching, and supporting effective liberal learning.* Washington, D.C.: Association of American Colleges. (ERIC Document Reproduction Service No. ED 290387).

Teichman, Y. (1984). Predisposition for anxiety and affiliation. *Journal of Personality and Social Psychology, 29,* 405- 410.

Thiagarajah, S. (1998). *Facilitation: How to conduct and debrief experiential activities.* NASAGA Pre-conference workshop, Atlanta, GA.

Torres, M., & Macedo, J. (2000). Learning Sustainable Development. *Simulation & Gaming, 31*(1), 119.

Tuckman, B. W. (1965). Developmental sequence in small groups. *Psychological Bulletin, 63,* 384-389.

Turner, J. C., & Meyer, D. K. (2000). Studying and understanding the instructional contexts of classrooms: Using our past to forge our future. *Educational Psychologist, 35*(2), 69-85.

Vernay, M. (1990). Curriculum and instruction to reduce conflict. *ERIC Clearinghouse on Urban Education 64.* (ERIC Document Reproduction Service No. ED 322 274)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Wheelan, S. (1990). *Facilitating training groups*. New York: Praeger.

Wheelan, S. (1994a). *Group processes: A developmental perspective*. Boston, MA: Allyn & Bacon.

Wheelan, S. (1994b). *The Group Development Questionnaire: A manual for professionals*. Philadelphia, PA: GDQ Associates.

Wheelan, S., & Hochberger, J. (1996). Validation studies of the Group Development Questionnaire. *Small Group Research, 27*(1), 143-170.

Wheelan, S., & Tilin, F. (1997). The relationship between faculty group effectiveness and school productivity. *Small Group Research, 30*(1), 59-81.

Wolfe, J. (1975). A comparative evaluation of the experiential approach as a business policy decision-making environment. *Academy of Management Journal, 18*(3), 442 - 452.

Wolfe, J. (1978). *Correlations between academic achievement, aptitude, and business game performance: Exploring experiential learning; Simulations and experiential exercises*. Tempe, AZ: Arizona State University.

Wolfe, J., & Jackson R. (1989). An investigation of the need for algorithmic validity. *Simulation & Games, 20*(4), 272-291.

Wolfe, J., & Roberts, C. R. (1993). A further study of the external validity of business games: Five-year peer group indicators. *Simulation & Gaming, 24*(1), 21.

Wyer, R. S. (1966). Effects of incentive to perform well, group attraction and group acceptance on conformity in a judgmental task. *Journal of Personality and Social Psychology, 4*, 21-26.

Yalom, I. (1975). *The theory and practice of group psychotherapy*. New York: Basic Books.

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PRESENTATIONS

1999 - 2000	23 Seminars on Masculine Mentoring, Masculine Journey, Masculine Spirituality, & Spiritual Gifts Discovery for churches in Illinois, Indiana, Michigan, Minnesota, and Wisconsin.
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