**The Dissertation Committee for Maria Lourdes del Consuelo De Hoyos Guevara
certifies that this is the approved version of the following dissertation:**

ASSESSMENT OF TEAMWORK IN HIGHER EDUCATION
COLLABORATIVE LEARNING TEAMS:
A VALIDATION STUDY

Committee:

Paul E. Resta, Supervisor

Pedro Reyes

Lynda G. Cleveland

Elaine L. Danielson

Ann K. Brooks

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COLLABORATIVE LEARNING TEAMS:
A VALIDATION STUDY

by

Maria Lourdes del Consuelo De Hoyos Guevara, Lic. M.A.

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Dedication

To my daughters Lourdes, Venus Victoria and Angela Catalina with all my love.

To my family who taught me to value learning, and gave me their unconditional love as I traveled the road of education.

To the women who have the opportunity to redesign their lives and to Doris Buffet, who through her support of the Sunshine Lady Foundation, makes this dream possible.

To my mentors who gave so much of themselves to facilitate my learning process.

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To Eva Veronica (†) my daughter, who taught me of new journeys to come, and to search for reasons in the big picture of life, instead of just asking why.

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To Armando Ledezma (†), healer, dedicated to the well-being of women, committed colleague and friend, admirable companion to his wife Sylvia and loving father of their daughters.

Assessment of Teamwork in Higher Education Collaborative Learning Teams: A Validation Study

Publication No._____

Maria Lourdes del Consuelo De Hoyos Guevara, Ph. D.

The University of Texas at Austin, 2004

Supervisor: Paul Resta

The study was a cross-sectional descriptive study conducted in a field setting, based on survey research, and team observations, with interviews and focus groups at the end of the project that focused on the examination and measurement of face-to-face teamwork in a collaborative learning college setting. The purpose of this study was to examine the validity of the Teamwork Assessment Scale (TAS) and its relation with perceptions of personal characteristics of Instrumentality and Expressiveness as measured by (a) the Personal Attributes Questionnaire (PAQ) (Spence & Helmrich, 1978), (b) with a measure of Team Flow (De Hoyos, Dara-Abrams, & Bischoff, 2004) and (c) Team Synergy (De Hoyos & Resta, 2004). In a pilot study of online teamwork, an exploratory factor analysis of the TAS revealed the presence of two factors that underlie online teamwork as measured by the TAS (Menchaca & Resta, 2002). The factors were labeled Task Management and Social Interaction. In this study exploratory

factor analyses were conducted to examine the constructs that underlie face-to-face teamwork. The TAS was adapted for use with face-to-face teams and a dimension of Trust was added to the TAS scale. Reliability of the scale was calculated and the properties of items within each scale were examined. Convergent and discriminant validity relationships with related constructs of Instrumentality and Expressiveness were assessed by means of correlation analyses. A Social Interaction Model was developed from a Socio-cultural perspective and its fit to the data collected was assessed through path analyses. The model fit the data and the study provided evidence for the validity and reliability of the TAS. Teams were observed while accomplishing their projects and four case studies provided an in depth view of the team dynamics and interactions. The case studies demonstrated that performance in teams relates to the following attributes: positive social interaction shared leadership, personal and task trust, and effective conflict management to keep the team environment positive and productive.

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CHAPTER 1

INTRODUCTION

Cooperation and teamwork have always been hallmarks of human evolution. Historically new knowledge and technologies have been created through applying human resources to specific problems, from dilemmas of how to satisfy the basic needs of food and shelter, to problems of how to deploy human labor in the name of erecting monuments.

Starting 30,000 years ago, our human ancestors (the Cro-Magnons) prospered while other groups like the Neanderthals faded out because early humans were able to develop highly sophisticated and cooperative learning techniques. These techniques gave rise to increased social organization; group hunting routines; creative experimentation with a variety of materials; sharing of knowledge; and division of labor, trade, and transportation systems (Johnson & Johnson, 2000, p. 7). In short, cooperation and teams have been key ingredients in the human success story.

It was not until the beginning of the 20th century, however, that the role of the group in learning environments began to be closely examined. Koffka (1935) and Lewin (1944) suggested that groups were dynamic wholes in which the interdependence among members could vary (Johnson & Johnson, 2000). Lewin (1944) further suggested that any change to a member or subgroup results in a change to all components of the group system. In the second half of the 20th century, social psychologists like Hovland (1953), Bem (1972), and Bruner (1955) took earlier group theory and raised the stakes—claiming that the construction of knowledge and social influence is determined, in part, by the quality of interpersonal relationships.

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With the rise of the cyber age, technology has become a key element in modern learning environments. Technologies such as the Internet allow groups to be spread over a broad geographical area. Teams are no longer constrained by culture, geography, or language. This reliance on technology and the creation of new team formats is reflected not only in the workplace but also in our colleges and universities. In these higher education environments, ranging from virtual online universities to traditional campuses, we are now faced with the challenge of developing collaborative skills in students. We must facilitate dialogue between students, forge learning teams, and achieve measurable outcomes. This is not only demanded by modern educational theory, but by a multicultural society and economy in which traditional borders and boundaries have ceased to exist.

Higher Education and Cooperative Learning

College graduates of the new millennium need to master academic knowledge in key areas, but they also need to function in a variety of team learning environments. From the Johnson and Johnson (1999) perspective, to develop cooperative learning environments that are more productive than competitive and individualistic efforts, the following elements need to exist: positive interdependence, promotive (face-to-face) interaction, individual accountability and personal responsibility to achieve the group's goals, interpersonal and small-group skills, and frequent and regular group processing of current functioning to improve the group's future effectiveness not only in the workplace but also in colleges and universities. In these higher education environments, ranging from virtual online universities to traditional campuses, teachers now face the challenge of developing collaborative skills in students. Higher education teachers must facilitate dialogue between students, forge learning teams, and achieve measurable

outcomes. This is not only demanded by modern educational theory, but by a multicultural society and economy in which traditional borders and boundaries have ceased to exist.

Within this context, a team is a set of interpersonal interactions structured to achieve established goals (Johnson & Johnson, 2000). A learning team is a set of interpersonal interactions among peers of equal status structured (a) to maximize each member's acquisition of knowledge and skills, and (b) to coordinate and integrate each member's efforts with those of the other team members (Johnson & Johnson, 2000). Proficiency in teamwork requires team members to master not only "ways of doing" but also "ways of being" (Levin & Kent, 2002, p. 12).

It is important to note that traditional higher education practices do not develop teamwork skills. Throughout the world in the majority of higher education institutions, educational practices still focus on lectures and individualistic and competitive learning. As noted in national reports such as *Building a Nation of Learners* (Business and Higher Education Forum, 2003), higher education needs to shift the teaching-learning process to more collaborative and interactive student-centered learning environments so that students can develop the skills required by the demands of present society.

Education needs to advance by adopting educational models consistent with current knowledge, as noted in *How People Learn* (*National Academy of Science*, 2001): Learning is a process that occurs in a reflexive dialogue where the conversation precedes the action. Knowledge is constructed through social interaction. Further, the conversation or exchange of words—the social interaction—becomes the glue that binds a community (Owen, 2000). To develop a true community of learning in colleges and universities, teachers and administrators must facilitate the creation of student project teams. It is within these groups that students can extend their teamwork

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repertoire (a) to be alert to cultural differences, (b) to learn new attitudes and behaviors, and (c) to judge where and when it is appropriate to apply them. This approach will reflect more accurately the demands of a multicultural society and workforce. People are more similar than different but do not always understand each other; culture colors perception and the ability to work with others. Working in teams with members of different cultures helps develop the mutual understanding needed in a multicultural workforce.

However, changing established educational paradigms to incorporate collaborative learning environments where students can learn and improve their skills to work with others is a difficult process. In a large number of universities, faculties generally teach students according to the traditional lecture-driven mode because this is part of the inherited paradigm of higher education. New strategies and resources will be needed to help faculty move from the traditional mode of direct instruction to more engaging learner-centered instruction. Faculty adoption of innovations in teaching in postsecondary institutions is most often a voluntary and isolated process. To promote such evolution in teaching methodology, a deeper understanding must be developed of how to shift face-to-face, lecture-based teaching to interactive student-centered learning.

Need for Research in Factors Related to Successful Learning Teams in Higher Education

Research is needed to better understand practices that facilitate the process of collaborative learning and the characteristics that learning environments need to have to develop the collaborative skills of students. Individual student's needs are different; each individual comes to work on a team with unique personal characteristics and skills. Hartley and Bendixen (2002) suggested learners' characteristics affect students' ability

to succeed with new ways of teaching and learning. They also stressed the importance of learning from previous research in this area.

Collaborative Learning Assessment

Two essential conditions for successful learning teams are individual and group accountability. Group accountability may be established by evaluating the learning team's product performance. Individual accountability may be accomplished through assessment by other team members of an individual member's contributions to the team.

Assessment of personal characteristics and contributions to the teamwork process may also assist students in their development as reflective practitioners who are engaged in creating new knowledge and products for the benefit of all members.

Reflection has also been shown to be an important aspect of learning. The power of self-assessment lies in an individual's ability to reflect on his or her own activities and performance in the same way as (s) he reflects on those of his or her peers. Individuals also receive valuable feedback on their performance and contributions from assessments made by team members. According to Johnson and Johnson (2000) "all humans need to become competent in taking action and simultaneously reflecting on their action in order to learn from it" (p. 51).

Recent pilot exploratory work on self- and peer-assessment conducted in online interactions of students (Menchaca & Resta, 2002) has found two theoretical constructs underlying the processes of online collaborative learning work: Task Management and Social Interaction. These two factors are related to the successful attainment of tasks and the creation of positive social interactions.

These factors appear related to earlier gender research that described the personal characteristics of Masculinity and Femininity (Spence & Helmrich, 1978), now named Instrumentality and Expressiveness in the gender role research literature. The new nomenclature was established because the dimensions Spence and Helmrich measured were found not to be related to gender, but to be related to personal characteristics. Instrumentality and Expressiveness were described previously in the sociological literature by Bakan (1966) and other theorists as largely agenetic, instrumental characteristics with communal, expressive attributes of Agency and Communion.

The electronic world of work shared by modern men and women requires the exercise of instrumentality or task management for successful online professional activities. It is also important to maintain satisfying personal relationships in a promotive social climate. Effective teamwork is enhanced through positive expressiveness and empathy that promotes constructive interaction and the well-being of others. Both characteristics represent the sine qua non ingredients of successful interaction and attainment of the team common goals (Menchaca & Resta, 2002).

In support of the presence and importance of a Social Interaction Model are concepts from the sociocultural perspective (Vygotsky, 1978) where social interaction is a condition sine qua non for social learning. A number of researchers have concluded that the cognitive processes most necessary for deeper levels of understanding and the implantation of information into memory, such as elaboration and metacognition, occur only through dialogue and interaction with other people. Johnson, Johnson, and Stanne (1985) found that "cooperative learning promoted more dialogue and social interaction than did competitive and individualistic learning" (p. 675).

Learning and working with other people is beset with challenges. In the best-case scenario, positive social interaction leads to the development of a learning community. The bonds that glue a community together are created through conversation within a positive social atmosphere. A learning community also requires reciprocity, shared accountability, trust, predictability, and social cohesion. In dialogue, plans to achieve group goals are created. In addition to positive interaction, timely performance of tasks is crucial to the team goals. Accountability to the team is also an essential element in this approach as it influences timely team member performance.

The Teamwork Assessment Scale (TAS) is an instrument developed to assist the process of reflection during a semester either for self- or peer-assessments of Task Management Social Interaction and Trust contributions to the team collaborative learning process. The TAS has not been used in face-to-face teamwork and its validity and reliability for this purpose remain unknown. The original TAS was developed to assist students in the reflection process on their teamwork and to provide instructors with a window to monitor learner performance. It also allowed the teamwork experience to be evaluated from a peer perspective.

If TAS is a valid measure of the factors of Task Management, Social Interaction and Trust in teams, it can be used to test if high performance collaborative learning teamwork requires the joint contribution of Task Management, positive Social Interaction and Trust.

Whether these exploratory findings of the TAS on online teamwork hold in face-to-face teams and whether the factors underlying face-to-face teamwork are the same as those found in online learning environments were questions of interest. It was interesting to understand whether Task Management, positive Social Interaction and Trust factors, helped predict Team Performance as measured by Team Flow and Team

Synergy. It was interesting to see how Personal Characteristics such as Instrumentality and Expressiveness, as well as the presence of Task Management, Social Interaction, and Trust resulted in Team Flow and Team Synergy.

Flow and Synergy as Measures of Team Effectiveness

The quality of products or performances of learning teams typically have been used as indicators of team success. Another view of team success is the extent to which members are working well together and experience full engagement while actively participating in their learning activities. The concept of flow may serve as an indicator of students' full engagement. Also their synergy manifested in the ways in which students achieve high levels of team integration those results in high productivity and creativity.

How can teachers assist students with different personal characteristics to achieve a state of high-performance collaboration characterized by a sense of excitement, fun, and a high level of engagement—a state of flow (Csikszentmihalyi, 1991)? Csikszentmihalyi and Lefebvre (1989) described flow as "a process of optimal experience that occurs When both challenges and skills are high, the person is not only enjoying the moment, but is also stretching his or her capabilities with the likelihood of learning new skills and increasing self-esteem and personal complexity" (p. 59).

According to Johnson and Johnson (1998), "the truly committed cooperative learning group is probably the most productive tool humans have…but not all groups become high-performance cooperative groups that achieve higher levels of creativity and productivity" (p. 24).

As stated above, teams do not only meet to share information and perspectives and make decisions they produce primarily because they are accountable and committed

to contribute to the team. In the process, "teams enjoy the social interaction and team members hold themselves and each other accountable for doing high-quality work" (Johnson & Johnson, 2000, p. 540).

The question then becomes: How can we get a group of team members to engage in a collaborative process with positive social interactions and where the motivation is exalted, the engagement is complete, and knowledge production results from the collaborative effort and the merging of perspectives?

Statement of the Problem

Teamwork for some students is easier than for others. The process of acquiring teamwork skills may be determined by students' personal characteristics and backgrounds. These personal antecedents and the characteristics of the learning environment may strongly influence the level of engagement with the team project. Ideally, each student grows intellectually while working towards a group goal. The ideal is for students not only to be high-performing team players, and also to form a high-performance team that can achieve success and a pleasurable experience of highly engaged teamwork.

Purpose of the Study

The purpose of this study was to examine the psychometric characteristics (validity, and reliability) of the TAS and examine its relationships with established constructs such as Personal Characteristics of Instrumentality and Expressiveness and Team Performance in Team Flow and Team Synergy.

For evidence of the Validity and reliability of the TAS, Exploratory Factor Analysis (EFA) was used to find the constructs underling the scale, reliability was assessed by means of internal consistency and item correlations, Convergent and Discriminant validity was assed by correlations to examine if theoretically consistent relationships with related constructs of Personal Characteristics of Instrumentality and Expressiveness and the TAS factors were present.

A nomological network formed between the self-assessment of face-to-face teamwork measured by TAS scale dimensions, Personal Characteristics of Instrumentality and Expressiveness and Team Performance by Team Flow and Team Synergy provided additional evidence for the criterion validity of the TAS constructs. Figure 1 next illustrates the Social Interaction Model developed for this study.

Figure 1. Social Interaction Model
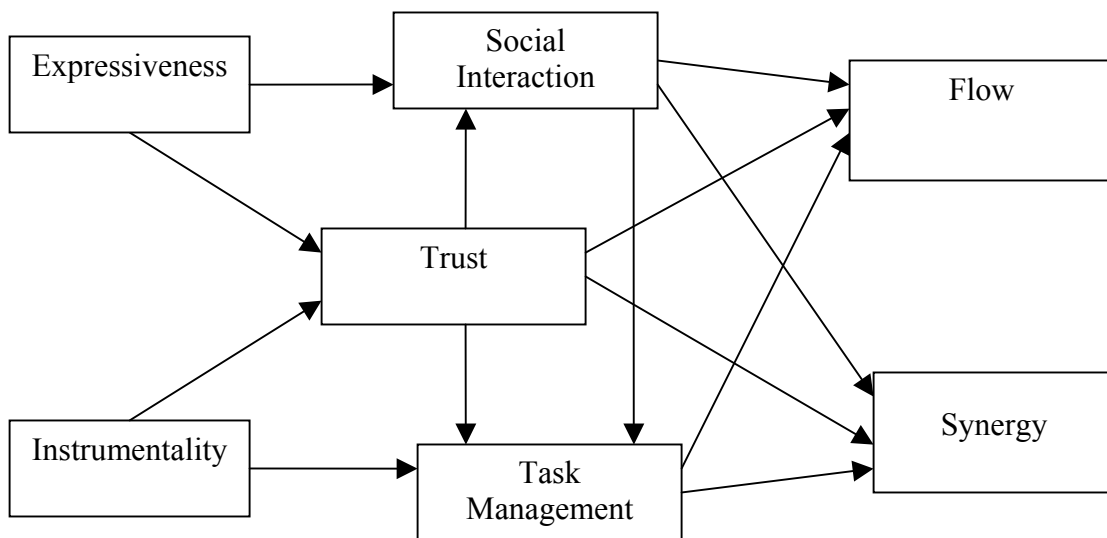
A case study approach with observations of extreme cases provided the opportunity to follow the teams longitudinally in their process and listen to student voices in interviews and focus groups at the end of the project. Chapter 3 describes the methodology of this study.

Research Questions

The study was guided by the following four research questions:

RESEARCH QUESTION 1:

Construct Validity: Teamwork Factors

1. What are the factors that underlie collaborative learning teamwork as measured by the TAS?

RESEARCH QUESTION 2:

Internal Consistency Reliability and Item Analysis of Teamwork Factors

2. What is the Internal Consistency Reliability of the TAS Factors: Task Management, Social Interaction and Trust?

RESEARCH QUESTION 3:

Construct Validity II-Convergent and Discriminant-: Personal Characteristics and Teamwork

3. What is the relationship between the TAS and the PAQ?

RESEARCH QUESTION 4:

Criterion Validity: Personal Characteristics, Teamwork and Team Performance

4. To what extent does the Social Interactions Teamwork Model fit the data?

This study explored how personal characteristics related to the process of teamwork and the relationship between the teamwork process and the achievement of team flow in teams of students with different levels of Task Management, Social Interaction and Trust. The focus of the study included a team intervention component within a large course taught in a large Southwestern public university. Participants in the course were invited to fill out paper-and-pencil questionnaires presented in a class session.

The researcher met with the students in a class period to request their volunteer participation in the study. The team instructional interventions have been pilot tested in previous courses and improved as needed. Teamwork, as experienced in this large course setting, is an adaptation of cooperative learning strategies to fit college-level students "to maximize students' academic learning, and also to promote prosocial behavior, positive self-esteem, favorable attitudes toward school and learning" (Purdome & Kromerey, 1995).

Examining the development of these teamwork skills longitudinally is important. Teams that volunteered were observed by the researcher in their team meetings. The information gather was used to achieve a deeper understanding of the team experience of college students and to clarify the quantitative data analysis results. Examining how they might change after graduation may be useful but is beyond the scope of this study. The ultimate goal of this research is to identify, develop, and a

validate assessment tool useful in learning environments, which are also meaningful in the professional world of work.

Significance of the Problem and Justification of the Study

It was expected that this study advanced our understanding of how to assist the teamwork process to provide a rich academic experience that fully engages students working in teams to achieve flow. If TAS is found to be a valid measure, the factor scores may allow identification of the extent to which effective collaborative learning teamwork requires the joint contribution of Task Management, Social Interaction and Trust.

Teamwork in collaborative learning can lead students to greater cognitive involvement, greater activation, and higher levels of motivation including higher engagement than traditional modes of instruction. Additionally, higher education teachers need to advance the understanding of teamwork to prepare students with skills needed for work in the present context of knowledge expansion and professional learning communities in the workplace.

Beyond understanding the validity and interaction between the Task Management, Social Interaction, and Trust dimensions of Teamwork, this study provided faculty with information needed to better understand the teamwork assessment process. This will allow them to monitor and facilitate students while they work in productive and creative teams that achieve a state of engagement with a sense of excitement in their learning process and fun—a state of flow. In addition, the understanding of student's needs derived from their personal characteristics will help design interventions that can deliver individualized assistance to students and facilitation to teams according to the characteristics of their members.

Definitions

Expressiveness/Femininity: Items presented in the *Femininity* scale were defined as socially desirable characteristics that refer largely to expressive, communal attributes. High scores are indicative of greater self-perceived communion. The adjectives and phrases that describe femininity are emotional, able to devote self completely to others, gentle, helpful to others, kind, aware of feelings of others, understanding of others, and warm in relations with others. Scores of 1 represent lower expressiveness; scores of 5 represent higher expressiveness. From the scores of the questions a mean is calculated.

Instrumentality/Masculinity: Items presented in the *Masculinity* scale were found to refer largely to instrumental, agenetic characteristics. The adjectives and phrases that describe masculinity are independent, active, and competitive, can make decisions easily, never gives up easily, self-confident, superior, and stands up well under pressure. High scores are indicative of greater self-perceived agency. Scores of 1 represent lower instrumentality; scores of 5 represent higher instrumentality. From the scores of the questions a mean is calculated.

A *learning team* is a set of interpersonal interactions among peers of equal status structured (a) to maximize each member's acquisition of knowledge and skills, and (b) to coordinate and integrate each member's efforts with those of the other team members (Johnson & Johnson, 2000).

Personal Characteristics represents the scores obtained in the PAQ (Spence, Helmreich, & Strapp, 1975), used as a revised (Lenney, 1991) self-assessment or peer-assessment measure of instrumentality and expressiveness and built on a 5-point Likert-type scale. Items will be presented as words or phrases and respondents will be asked to

rate the extent to which each item is descriptive of themselves, using 5-point interval scales, from 1 = *never true of me* to 5 = *always true of me*.

Self-assessment is defined as the learners' taking responsibility for monitoring and making judgments about aspects of their own learning. It requires learners to think critically about what they are learning, to identify appropriate standards of performance, and to apply them to their own work.

Social Interaction is a factor representing the social aspect of human interaction required for positive and successful interaction in the group.

Task Management is a factor representing the active process of engagement in actions that result in the successful completion of tasks.

Trust is a factor measuring interpersonal and communication skills that lead to getting to know and share of oneself with others, and interact and manage conflict.

A *team* is a set of interpersonal interactions structured to achieve established goals (Johnson & Johnson, 2000).

Team Flow for the purpose of this study is defined as a process of optimal experience that occurs when teams participate in a highly challenging project where the team project requires the use of members' skills, and team members are mutually engaged in collaboration; intensely involved in their team activities; experiencing shared knowledge building; and not only enjoying the process of teamwork, but also stretching their capabilities with the likelihood of learning new skills, especially learning to work in teams.

Team Synergy for the purpose of this study is defined as the state of high performance evidenced by high levels of creativity and productivity.

Teamwork for the purpose of this research study is a learning situation where a student is assigned to a team with which he or she will share the task of developing a

product that will be presented at the end of the semester in a course fair. Teamwork for the purpose of this study will be measured with a paper-and-pencil instrument composed of 28items that describe characteristics that represent ingredients of successful Social Interaction: positive expressiveness and empathy to allow participants to engage in peaceful, constructive, satisfactory interaction and behaviors related to the attainment of the team's common goals required for successful achievement of task activities. Twelve items were developed to operationalize Task Management and eleven items operationalize Social Interaction and five items to operationalize Trust (see Appendix A).

Limitations and Weaknesses of the Study

This type of cross-sectional descriptive study based on survey research, and longitudinal team observations, with interviews and focus groups at the end of the project, has the following validity treats and possible weaknesses of the study: history, maturation, instrumentation, mortality and the following external validity treats: Participant representativeness, testing-treatment interaction, selections-treatment interference, specificity of the variables, experimenter effects, and reactive arrangements. These threats to validity are discussed in detail in Chapter 3.

Outline of the Dissertation

From a scientific point of view, it is important to understand the joint contribution of Social Interaction, Task Management and Trust factors to the performance of teams. The main aim of this dissertation is to validate a measure of teamwork as a scaffolding tool that supports student development of self- assessment

skills. Supporting students in developing their teamwork performance-based skills involves activities in which students collaborate throughout time. By self-report of Teamwork combines with observation of team dynamics to clarify the interpretation of the scores throughout a team project, the validity that the Teamwork Assessment Scale can be investigated. In order to conduct this type of studies in the future, tools that are valid and reliable are needed.

Chapter 2 contains a literature review covering cooperative and collaborative learning. Higher education and cooperative learning will be discussed first. Literature regarding constructivist and experiential learning environments will be reviewed. Collaborative team formation and the factor of Social Interaction will be defined and examined. Research will be reviewed on flow, especially as it related to higher education learning. Self- and peer-assessments of collaborative learning teamwork will be described. Teamwork will be examined from evolutionary and sociological and psychological perspectives. Finally, the characteristics and assessment of effective teamwork will be identified through the research literature.

Chapter 3 contains the methodology used in the study, including the research setting, research design and procedures, data analysis procedures for each research question, the instruments, including the researcher as instrument for the case study section, procedures for protection of human subjects, and limitations of the study.

Chapter 4 reports the results of the data analyses for each of the four research questions. For question 1, results of exploratory factor analysis are examined. Factor loadings are studied for each dimension. For question 2 Cronbach Alphas are reviewed and item analysis is presented for each factor. In question 3 the correlations of the TAS factor with other measures are examined. Finally in question 4 the results of path

analyses develop to test the nomological network of the dimensions measured by the TAS.

Chapter 5 Four case studies are presented describing teams with different characteristics and the results of both methodologies are brought together.

Chapter 6 summarizes the study of the psychometric characteristics of the TAS and what was learned through the use of TAS as a tool and through the team observations, interviews and focus groups conducted to study the interaction of teams working in collaborative learning environments and presents and discuss the conclusions about the validity and reliability of the TAS and the Social Interaction Model built to advance our understanding of the TAS properties and the work of teams. At the end a new model of high performance derived form the data analysis is built based in what was tested and the new emergent themes. The discussion is followed by implications for theory and practice and the needs for further research.

CHAPTER 2

LITERATURE REVIEW

New ways of teaching and learning often involve students working in teams. In order to learn to work in teams and to become reflective practitioners, students need to learn to examine their performance.

Assessment is now considered a tool for learning, but assessment of teamwork is problematic. Assessment tools are needed to assist the process of reflecting and giving and receiving feedback performance to and from peers. The tools need to be in tune with the current strategies of teaching and learning derived from our understanding of how people learn in social interaction. The TAS in an instrument developed to measure key dimensions of team performance and its psychometric characteristics needed to be examined. Current understanding of the performance of students working in teams sustains the Social Interaction Model. The TAS dimensions are based in Collaborative Learning theory and the principles under which the Social Interaction Model develop to advance our understanding of key aspects of teamwork.

Higher Education and Cooperative Learning

The present world of work has an accelerated pace of change. It is impossible to predict accurately the jobs of the future. Many more unexpected changes will result from rapid changes in information and communication technologies. In such an era, traditional testing methods do not fit newer goals of lifelong learning, reflective thinking, critical reasoning, the capacity to evaluate oneself, and problem solving (Dochy & Moerkerke, 1997).

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People increasingly have to be able to acquire knowledge independently and to use this body of organized knowledge to solve unforeseen problems. As the main goal of higher education moves toward producing students as reflective practitioners who are able to critically examine their own practice (Falchikov & Boud, 1989; Kwan & Leung, 1996; Schön, 1987), assessment criteria need to be aligned closely with the idea of lifelong learning. It is expected that people will change jobs at least 10 or 15 times during their working lives. Graduates will need to continually learn new knowledge and skills to fit the new working environments. A recent survey conducted at London School of Economics found that students aged 23 or under at graduation in 1996 felt only poorly –to moderately prepared for having a boss, the hours of work, the culture of the organizational workplace, and working in a team with other people (Levin & Kent, 2002).

Higher education systems need to be more attuned to needs of the business world. In the Business–Higher Education Forum's 1997 report, *Spanning the Chasm*, American companies claimed college graduates were lacking in nine key attributes necessary for today's high-performance jobs: leadership; teamwork; problem solving; time management; self-management; adaptability; analytical thinking; global consciousness; and the basic communications skills of listening, speaking, reading, and writing. Individuals who are adept in basic analytical reasoning and communication skills will have a strong foundation upon which to draw when challenged with new job tasks.

To develop these skills, higher education needs to be more in tune with current views of the learning process and commit to a radical change in the present ways of teaching and learning. Higher education teachers need to incorporate new knowledge about how people learn into their teaching practices. As noted by Dochy, Segers, and

Sluijsmans (1999), "successful functioning in this era demands an adaptable, thinking, autonomous person, who is a self-regulated learner, capable of communicating and co-operating with others" (p. 331).

The new realities of modern work also require a high level of teamwork. Students need to learn in school how to be active, independent, life-long learners who thrive in team environments. Groups and teamwork are commonly used in higher education to facilitate peer learning and to encourage students to develop their capacity for collaborative learning. The next section reviews the current views of the learning process and the characteristics of rich learning environments required to prepare students to be successful in a technology-based global society. Particular emphasis will be made on the following: concepts that lead to the construction of knowledge, conditions required in learning environments that facilitate good social interaction, team collaboration, and new views of assessment.

Constructivist Learning Environments

The most common teaching–learning paradigm in higher education remains focused on knowledge transfer and systematic instruction that emphasizes individualized work and limited use of technological applications. Changing the teaching and learning process from an instructor-centered to a learner-centered model constitutes a fundamental change in the educational system, starting with specific goals, values, and beliefs about learning and elements that support the learning process, such as curriculum, instruction, assessment, and policy (Fullan, 1991, 1993). Change is needed toward more "constructivist views of the learning process. Constructivism is not a theory about teaching, but is a theory about knowledge and learning" (Brooks & Brooks, 1993, p. vii). Constructivism is the worldview that recognizes learning as the

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process of constructing meaning about, or making sense of, experiences. Learning constructively, particularly in the social constructivist paradigm (Vygotsky, 1978), requires an environment in which collaboration is situated in authentic activities and contexts.

Constructivism is defined as a learning theory that "proposes that knowledge or meaning is not fixed…but rather is constructed by individuals through their experience…in a particular context" (Honebein, Duffy, & Fishman, 1991).

A Constructivist learning environment has been defined as a classroom in which "instruction is more a matter of nurturing the ongoing processes whereby learners ordinarily and naturally come to understand the world in which they live" (Knuth & Cunningham, 1991, p. 164). The Applying Technology to Restructuring and Learning Project developed a framework for understanding and exploring the implications of constructivist learning theory for teaching (Burns, Menchaca, & Dimock, 2001). The following six working constructivist principles were identified as important in developing and modeling authentic learning environments:

1. Learners bring unique prior knowledge, experience, and beliefs to a learning situation.
2. Knowledge is constructed uniquely and individually, in multiple ways, through a variety of authentic tools, resources, experiences, and contexts.
3. Learning is both an active and reflective process.
4. Learning is a developmental process of accommodation, assimilation, or rejection to construct new conceptual structures, meaningful representations, or new mental models.
5. Social interaction introduces multiple perspectives through reflection, collaboration, negotiation, and shared meaning.

6. Learning is internally controlled and mediated by the learner.

Constructivist learning environments use student-centered approaches characterized by students working together, autonomously, cooperatively and collaboratively, at their own pace and on real-world topics of their own choosing, with different groups conducting different activities simultaneously. The role of the teacher in constructivist learning environments is that of a facilitator or guide, coach, mediator, and co-learner with students, learning from and with students. The research of Roehrig-Knapp and Glenn (1996) has supported this co-learning role of the teacher in a constructivist learning environment.

Active construction of meaning (Vygotsky, 1978) about experiences should take place through "experiential exercises followed by interpersonal interaction in small groups, and with facilitators to guide the group towards useful conclusions" (Romiszowski, 1997, p. 33). These concepts are aligned closely with elements of experiential learning environments.

Experiential Learning Environments

Experiential learning has been defined as generating an action theory from one's own experiences and then continually modifying it to improve one's effectiveness (Johnson & Johnson, 2002). Recently, Standerfer's (2003) conceptualization of experiential education in classrooms referred to "creating and refining knowledge and skills through experiences requiring (a) high levels of physical activity, (b) critical thinking, (c) real-world relevance, (d) social interaction, and (e) perceived risk" (p. 7). Such activities result in higher levels of student engagement.

From the experiential learning research perspective, the following elements of learning environments affect the level of student engagement and have a positive relationship with student performance:

1. *Physical activity.* Physically taking part in an experience engages students mentally (Cain & Cain, 1991). More physically engaging activities require more thought about the elements of the experience and the participation in it.

2. *Critical thinking.* Thinking that challenges students to understand concepts, make new connections, and solve problems is more engaging than merely storing factual information to recall at a later time. Higher order critical thinking keeps students engaged and reduces the amount of off-task behavior (Gamoran & Nystrand, 1992).

3. *Real-world relevance.* Actions with real-world consequences lead to the creation of meaning (Dewey, 1938). Experiences with real-world applications and consequences provide more meaning for students and are thus more engaging. Standerfer (2003) noted that school-based activities should provide students the opportunity to present their knowledge to a broader real-world audience and to make new knowledge of immediate relevance, resulting in education experiences with higher levels of student engagement.

4. *Social Interaction.* Learning can be enhanced through interacting with others (Vygotsky, 1978). Being able to talk and interact with others generates more ideas in a problem-solving situation.

5. *Uncertainty.* A level of uncertainty or anxiety requires students to focus more on the task as a means of self-protection and to resolve the mental disequilibrium (Caine & Caine, 1994; Piaget, 1968).

De Corte (1996) referred to the importance of designing powerful learning environments that provide authentic contexts, emphasize the exchange of ideas between participants, and rely on the active engagement of the learner. Powerful learning environments have four main characteristics:

1. They provide authentic, open problems and learning materials, which have personal meaning for students and are presented in a variety of formats.

2. They use teaching methods that arouse interest, activate prior knowledge, and clarify meanings, and model appropriate learning strategies and reflective processes.

3. They initiate external regulation of specific learning strategies.

4. They encourage monitoring strategies and discussing them in small groups, whereby a classroom culture is achieved, which encourages reflection on the process. The recognition of the power of working in small groups is also emphasized in collaborative learning.

Figure 2 designed by Resta (2002) illustrates characteristics of student-centered learning environments designed to engage learners to collaborate in authentic tasks, in authentic contexts, and using authentic tools and authentic forms of assessment.

Research on cognitive learning has also shown that engaging in dialogue and working collaboratively with others facilitates learning and the development of deeper levels of understanding. In the new paradigm, the instructor integrates cognitive tools into his or her instructional practices and generates new constructivist learning environments in which students are more active and responsible for their own learning. As noted in Figure 4, collaboration represents a critical component of constructivist-based learning environments.

Collaboration

Coaching / Scaffolding

Authentic Tasks / Activities

Authentic Tools

Students / Peers

Teacher / Co-Learner

Authentic Context

LEARNER

Information Resources

Technology

Reflection

Authentic Assessment

Multiple Perspectives

Paul Resta
Learning Tech. Center
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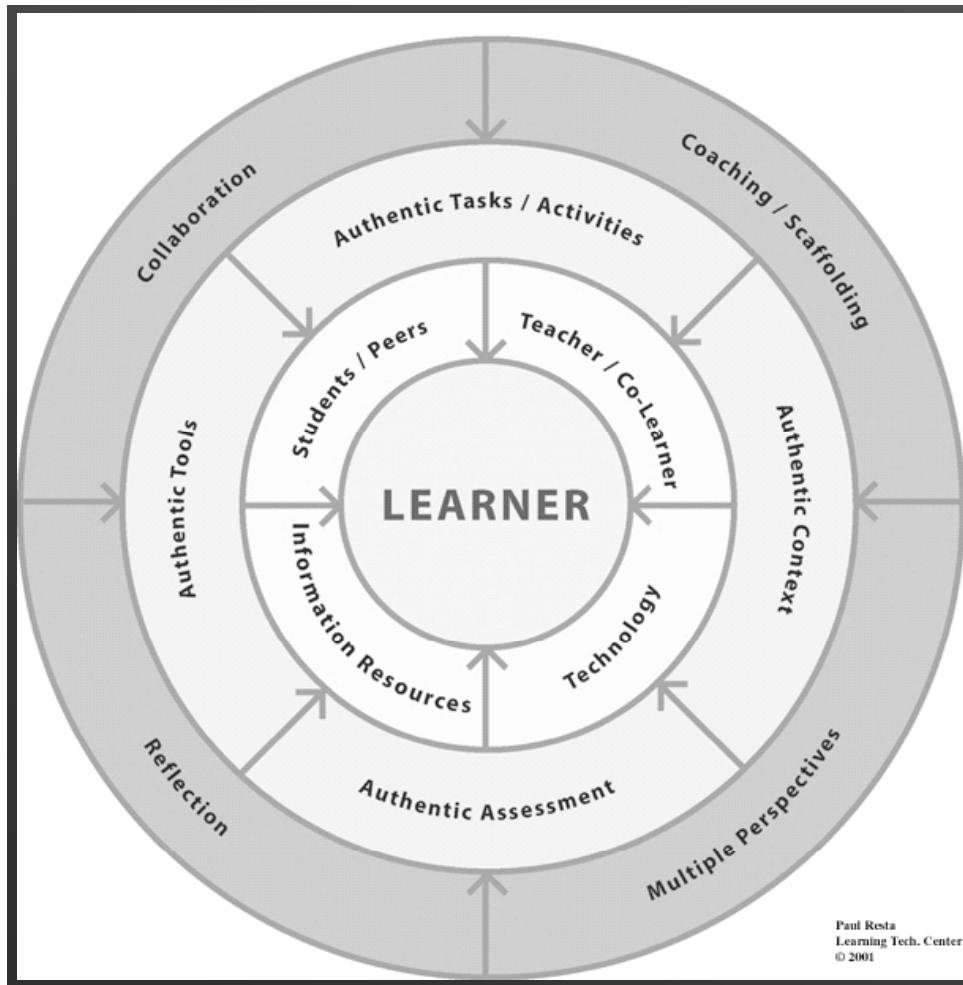
Figure 2. Constructivist (student-centered) Learning Environments.

Collaborative Learning Environments

Collaborative learning environments are powerful learning environments characterized by the view that *learning* means actively constructing knowledge and skills on the basis of prior knowledge, embedded in contexts that are authentic and offer ample opportunities for social interaction. Since the goals as well as the methods of instruction are oriented towards more complex curricular objectives, assessment

practices increasingly must incorporate various kinds of performance assessments in which students have to interpret, analyze, and evaluate problems and explain their arguments.

The basic idea of collaborative learning can be conveyed using the words of Harasim (1989):

> Knowledge building occurs as students explore issues, examine one another's arguments, agree, disagree, and question positions. Collaboration contributes to higher order learning through cognitive restructuring or conflict resolution, in which new ways of understanding the material emerge as a result of contact with new or different perspectives....Collaborative learning is predicated upon interaction. (p. 55)

Similarly Harasim, Hiltz, Teles, and Turoff (1995) defined collaborative learning practically as "any learning activity that is carried out using peer interaction, evaluation, and/or cooperation, with at least some structuring and monitoring by the instructor" (p.30).

Slavin (1994) defined collaborative learning as an instructional method in which small groups of learners work together to accomplish shared goals. From Slavin's (1989) perspective, three issues are important for effective collaborative learning: social interaction, individual accountability, and positive interdependency.

1. *Social Interaction*. Cooperative learning groups are both an academic support system (every student has one or more peers to help him or her learn) and a personal support system (every student has one or more peers committed to him or her as a person). In interactions with others, multiple perspectives on reality can be made more explicit. The process includes teaching one's knowledge to others, orally explaining how to solve problems, checking for understanding, discussing concepts being learned, and connecting present with past learning. It is through promoting each other's learning

that members become personally committed to each other as well as to their mutual goals. To establish criteria for performance, students negotiate assessment tasks and criteria (Slavin, 1989).

2. *Positive interdependency*. Crucial to the success of collaborative learning is positive interdependence. Positive interdependence is the glue that holds team members together and creates a commitment to the success of group members and individuals. When groups are successfully structured, team members perceive that each group member's efforts are required and indispensable for group success. Members are linked with each other in a way that one cannot succeed unless everyone succeeds. Additionally, team members perceive that each group member has a unique contribution to make to the joint effort because of his or her resources and/or role and task responsibilities (Slavin, 1989).

3. *Individual and group accountability*. Two conditions are essential for successful collaborative learning: the provision of both individual and group accountability for completion of the learning tasks (Slavin, 1989). Students are made responsible for an active contribution to group discussions. Typically, the evaluation of the product and performance of the team fosters group accountability. Evaluating the team members' contributions to the team effort fosters individual accountability.

From the Johnson and Johnson (2000) perspective, five important elements of cooperative learning, need to be in place: positive interdependence, promotive interaction, individual accountability, interpersonal and small-group skills, and group processing.

1. *Positive interdependence*. Team members are linked to each other in such away that each team member cannot succeed unless the others succeed and/or that each member's work benefits the others (and vice versa).

2. *Promotive interaction*. Individuals encourage and help each other's efforts to reach the group's goals.

3. *Individual accountability*. All group members are held accountable for doing their share of the work and for mastery of all of the material to be learned.

4. *Interpersonal and small-group skills*. Specific skills are needed when learners are learning within a group; students who have not been taught how to work effectively with others cannot be expected to do so (Sharan & Sharan, 1992).

> To coordinate efforts to achieve mutual goals students must (a) get to know and trust each other, (b) communicate accurately and unambiguously, (c) accept and support each other, and (d) resolve conflicts constructively…. The interpersonal and small group skills of the members may determine the level of members' achievement and productivity. Not only do social skills promote higher achievement, they contribute to building more positive relationships among group members. (Johnson & Johnson, 2000, p. 118)

5. *Group processing.* The purpose of group processing is to clarify and improve the effectiveness of the members in contributing to the joint efforts to achieve the group goals. The group determines which behaviors should continue or change for maximizing success based upon refection of how the group has performed so far. Group processing contributes to "clarify and improve the effectiveness of the members in contributing to the joint efforts to achieve the group goals" (Johnson & Johnson, 2000, p. 120).

The five elements are highly related to each other. For example, a positive interdependence results in promotive interaction, and promotive interaction requires group members to possess small-group skills. If the conditions are met, this approach will increase the learner's efforts to achieve, the quality of relationships among participants, and the participants' psychological health (Johnson & Johnson, 1989).

In summary, collaborative learning refers to instructional methods in which learners work together in small teams composed of students with differing ability levels to accomplish academic goals (Hiltz Coppola, Rotter, Turoff, & Benbunan-Fich, 2000, Reeves & Reeves, 1997). Learners use a variety of learning activities to master material initially developed by an instructor or to construct knowledge on substantive issues in environments where teachers teach for the most part indirectly, by reorganizing students socially and designing appropriate tasks (Bruffee, 1993). Essential for effective collaborative learning are social interaction, positive interdependence, interpersonal and small group skills, individual accountability, and group processing.

The process of joining teams is reviewed in the following section, including the roles played by group members and conditions required for effective functioning of teams. In addition, the relation between collaborative learning and self- and peer-assessment will be examined as integral parts of becoming reflective practitioners.

Collaborative Team Formation: Development Stages and Roles

When individuals are placed in groups, differences in patterns of interaction may emerge. Some members participate more than others do. Some may make assertions more than they ask questions. Individuals who do not know each other may tend to be positive and supportive of other members more than they are disagreeable (Bales, 1970; Kimble & Wooddell, 1996).

In newly formed groups, two types of leaders usually emerge: a task-oriented person and an interpersonally oriented person (Bales, 1950). Usually, the task specialist and the socioemotional specialist are two different people. These two kinds of emergent leaders are determined by the quantity and types of verbal comments they make. In some groups, they are the same person. A task-oriented leader is the person who gives

the most information and suggestions, asks for the most information and suggestions, and makes the most task-relevant comments. A socioemotional leader is the person who acts the most friendly, laughs and jokes the most, acknowledges or responds to others the most, and makes the most irrelevant comments (Sorrentino & Field, 1986). One might assume that a stronger task-oriented leader would contribute to better performance, but there is no evidence that this is true in all conditions (Fiedler, 1971; Sorrentino & Field, 1986.) Status characteristics, which are visible properties that individuals have upon entry to the group, such as sex, race, and age, can affect participation roles taken in such groups (Humphrey & Berger, 1981). For instance, men take a more central role (they talk more) when there is a strong task orientation (Strodtbeck & Mann, 1956). Women may take the central roles when the group or interpersonal orientation is prominent (Dabbs & Ruback, 1984). People who talk more are typically chosen as leaders, presumably because they have shown a willingness to share their knowledge with the group (Sorrentino & Boutillier, 1975; Stein & Heller, 1979). Talkers are chosen more as leaders even when the quality of their comments is poor. Those who talk first in groups are also likely to be chosen as leaders (Bass, McGehee, Hawkins, Young, & Gebel, 1953).

Team formation and development has been studied in face-to-face and online teams. Recent research has come out of electronic communities that work in teams. Carabajal, LaPointe, and Gunawardena (2003) provided a thorough review of group development in online learning communities. They reviewed the three models that are generally classified into one of three categories, as proposed by Mennecke, Hoffer, and Wynn (1992): progressive, cyclical, and Nonsequential models.

1. *Progressive models* imply that groups exhibit an increasing degree of maturity and performance over time and therefore develop in sequential stages.

2. *Cyclical models* of group dynamics imply a recurring or linear sequence of events that occurs within groups.

3. *Nonsequential models* of group development differ from both progressive and cyclical models in that they do not imply any specific sequence of stages or events.

Schutz (1958) described a cyclical model of group development "in response to three interpersonal needs: (a) inclusion of members in the group, (b) control of members' activities, and (c) affection between members" (p. 220). An example of a cyclical model of group development is the classic research by Tuckman (1965), later modified by Tuckman and Jensen (1977), that synthesized the results from 50 earlier studies and presented a model of group development where groups go through 5 stages: forming, storming, norming, performing, and adjourning.

1. *Forming* refers to the early stage where individuals and the group are uncertain and anxious about what lies ahead.

2. *Storming* refers to a stage of conflict where differences between individuals arise and develop.

3. *Norming* is the period where group members define relationships, norms, goals, roles, and establish leadership.

4. *Performing* refers to focusing on the task to completion.

5. *Adjourning* is the period where the group breaks up after completion of the task and/or reflects on the activity

Like Bales and Strodbeck's (1951) classification of task-oriented and socioemotional behaviors, Tuckman (1965) and Tuckman and Jensen (1977) found that each of the five stages in the team development model consisted of two aspects: task behaviors and interpersonal relationships.

The Tuckman and Jensen model has been extended by Johnson and Johnson (2000) to include seven stages:

1. Defining and structuring procedures:

When a group first meets, members are concerned about what is expected of them and the nature of the group goals…the coordinator should define the procedures to be used, define the group goals, establish the interdependence among members, and generally organize the group and announce the beginning of the group's work (Johnson & Johnson, 2000, p. 31).

2. Conforming to procedures and getting acquainted: Group members become acquainted with each other. They learn the strengths and weaknesses of the other and are dependent of the coordinator for direction, and clarification of the goals and procedures and the group norms.

3. Recognizing mutuality and building trust: "Members begin to take responsibility for each other's performance and appropriate behavior. Trust is built through sharing one's thoughts, ideas, conclusions, and feelings and having the other group members respond with acceptance, support and reciprocation of disclosures"(Johnson & Johnson, 2000, p. 32).

4. Rebelling and differentiating: Relationships among group members are often built through a cycle of becoming friendly, establishing independence through disagreement and conflict, and then committing oneself to a relationship.

5. Committing to and taking ownership of the goals, procedures, and other members:

The group becomes 'ours' rather then the coordinators. Motivation becomes intrinsic…Group members become concerned about each other's welfare, provide support and assistance, believe they can rely on the support and assistance of other members of the group, and truly become friends (Johnson & Johnson, 2000, p. 33).

6. Functioning maturely and productively: Group members clearly collaborate with each other to achieve a variety of goals and to deal with conflict in constructive ways while ensuring that their relationships are maintained at a high-quality level.

7. Terminating: Groups eventually end and members go their separate ways. The more mature and cohesive the group, the stronger the emotional bonds.

Nonsequential models "do not imply any specific sequence of events; rather, the events that occur are assumed to result from contingent factors that change the focus of the group's activities" (Carabajal, LaPointe, and Gunawardena, 2003, p. 220). McGrath's (1990, 1991) model proposed that "groups interact with and contribute to systems at three levels and perform three distinct functions: production, well-being, and member-support functions" (1990, p. 220).

Building a cohesive group or team is not an easy process, with early stages characterized by periods of conflict as objectives and roles are ambiguous, and norms and behavior are established.

In addressing the issues of group formation and functioning, various researchers have focused on the realm of interpersonal relationships. Bostock (1998) examined how to assess group work throughout a course. His results indicated that a definite pattern of interpersonal issues can be identified and measured. Interpersonal issues were very important at the beginning of the course, remained important throughout the course, but declined in significance as time progressed. Solidarity was also important to the groups in a general upward trend as the course progressed. Openness also increased within the groups over the course. Further, control and involvement decreased significantly; a definite pattern of interpersonal issues could be identified and measured. Much can be gained from the insights of such research in taking a fresh look at collaborative learning teams.

Social Interaction and Reflection as Conditions for Effective Collaborative/Cooperative Learning Teamwork

Throughout the years, researchers in psychology and computer science have studied individual learning and verbal interactions separately. Dillenbourg, Baker, Blaye, and O'Malley (1996) challenged the research community to build models for how learning and verbal interactions interrelate, how dialogue is used as a means for carrying out joint problem –solving, and how engaging in various interactions may change the beliefs of the agents involved. In other words, more needs to be learned about the interaction and behaviors of teams engaged in collaborative learning.

The use of experiential procedures to learn about behavior in groups was greatly influenced by Kurt Lewin. Lewin's research demonstrated that

> Learning is achieved most productively in groups whose members interact and then reflect on their mutual experiences. Students and colleagues learned how important it is to examine one's own experiences for potential principles about the way in which groups develop and work (Johnson & Johnson, 2002, p. 51).

From Lewin, therefore, came an emphasis on "studying one's own experiences in order to learn about group dynamics, on discussing mutual experiences to increase mutual learning and creativity, and on behaving democratically in structuring learning situations" (Johnson & Johnson, 2002, p.52).

During the development of models for understanding collaborative learning, researchers have sought to make a distinction between collaboration and cooperation. Cooperative work "is accomplished by the division of labor among participants, as an activity where each person is responsible for a portion of the problem solving," whereas collaboration involves the "mutual engagement of participants in a coordinated effort to

solve the problem together" (Dillenbourg et al., 1996, pg.190). This distinction places greater emphasis on the extent and quality of the exchanges that occur within groups of students in collaborative environments. According to Dillenbourg and his colleagues, we need models of collaborative learning.

For the purpose of this study collaboration or cooperation represents the philosophy of education where one learner helps another in social interaction to accomplish a common learning goal. Genuine collaboration is difficult to achieve and is fundamentally predicated upon genuine interdependence between group members (Salomon, 1995). Three features define genuine interdependence: (a) a need to share information, (b) a division of labor where roles complement each other, and (c) a pooling together of minds. Collaborative team projects, therefore, (a) require participants to share their resources and expertise to accomplish a project bigger than what they can accomplish on their own, (b) promotes the coming together of a group to divide the tasks to complement each other's different roles and abilities to achieve a creative synthesis in accomplishing a project that is the result of (c) the pooling together of their minds.

Collaboration involves mutual exploration of ideas and an examination of points of view in which there are agreements and disagreements, mutual questioning of positions, dynamic interaction, weaving of ideas, and convergence of perspectives and synthesis. The collaborative group comes together to exchange ideas in dialogue, share expertise and resources, and bring their contributions to the shared goal and results in mutual learning and creativity. The discussion that occurs during task engagement is an important component of collaboration because the cognitive benefits that are claimed for collaborative learning (Pressley & McCormick, 1995) must be mediated by the verbal exchanges among learners.

A fertile ground for observation of the collaborative interaction and exchange process is online learning environments. Online environments allow researchers to observe and study collaborative interactions. Cook (1997) has indicated that a very high proportion of online exchanges are merely social interactions. Interestingly, other studies have found that when the online environment is not functioning well, there is a low percentage of social interaction. Cook's finding that 95% of online interchanges were merely social is important because "social interaction is a critical component of situated learning as learners become involved in a *community of practice*" (Owen, 2000). It is likely that when the online discussion is not related to the task at hand, far from being a distraction from the academic tasks, the conversation contributes positively to the social interaction of team members. Conversation becomes the glue that bonds the community together.

When the social interaction does not flow in a positive way, the communication channels are not open, and knowledge as "the development of shared meaning among group members" (Brandon & Hollingshead, 1999, p. 111) cannot be gained. Therefore, positive social interaction is a condition for the social creation of knowledge (Brandon & Hollingshead; Verdejo, 1996).

Socioemotional processes underlie group forming, group dynamics, and the building of group structures, leading to the establishment of a sound social space. A sound social space is important because it facilitates and reinforces social interaction, which, in turn, influences the effectiveness of collaborative learning.

Dimensions of the Social Interaction Model

The belief that social interaction is a key element of group learning is shared by many distance education researchers, who have confirmed Vygotsky's (1978) notion

that social interaction is a conditio sine qua non for group learning. If there is collaboration, then social interaction can be found in it, and vice versa; if there is no social interaction, then there is no real collaboration (Garrison, 1993; Johnson et al., 1985; Soller, Lesgold, Linton, & Goodman, 1999). Trust building is also at the base of collaboration at the team development process dependent on the perceived psychological safety of the collaboration environment.

Kreijns, Kirschner, and Jochems (2003) have asserted that the factor of Social Interaction is important for both the cognitive processes of learning and the social (psychological) dimension of the social interaction. The two dimensions of Social Interaction—educational and (social) psychological—from Kreijns and colleagues. Perspective, are in line with Hare and Davies (1994), who categorized interaction as either task driven or socioemotional.

Concerning the cognitive processes necessary for learning, Social Interaction encourages critical thinking (Garrison, Anderson, & Archer, 2000), facilitates shared understanding among group members (Clark & Brennan, 1991), aids the social construction of knowledge (Bednar, Cunningham, Duffy, & Perry, 1995; Glaserfeld, 1995; Jonassen, 1994; Palincsar, 1998), and supports the acquisition of competencies (Keen, 1992; Short, 1984).

Kreijns and colleagues (2003) suggested

> The presence of a social (psychological) dimension to the social interaction in collaborative learning is essential to developing a learning community, relate to the socio-emotional aspects of group forming and group dynamics. In other words, it relates to processes that have to do with getting to know each other, committing to social relationships, developing trust and belonging, and building a sense of on-line community. These processes are not directly related to the task in the strict sense. (p. 33)

The realm of social interactions in learning environments, then, cannot be underestimated. Social interaction is not only important for cognitive processes for learning, but is equally important for socioemotional processes such as affiliation and impression formation, the development of social relationships, and the creation of a sense of cohesiveness and community (Harasim, 1991; Henri, 1992). These qualities determine the existence of a sound social space, which is essential for reinforcing learning through social interaction. Sound social space (Kreijns et al., 2003) has been defined as

> the network of social relationships amongst the group members embedded in group structures of norms and values, rules and roles, beliefs and ideals…characterized by affective work relationships, strong group cohesiveness, trust, respect and belonging, satisfaction, and a strong sense of community. (p. 33)

A sound social space determines, reinforces and sustains the social interaction that is taking place among the group members. A sound social space enables open and critical dialogue that neither harms nor offends group members because they know and trust each other (Rourke, 2000). These feelings of community can increase the flow of information between all learners while encouraging support, commitment to group goals, cooperation among members, and satisfaction with group efforts. In other words, a sound social space promotes positive feelings between group members such that learners benefit by experiencing a greater sense of well-being and having a larger set of willing individuals to call on for support (Rovai, 2001).

Solely focusing on task orientation in collaborative encounters in the interactive learning processes or other educational purposes blocks the development of social relationships and the creation of a sense of cohesiveness and community (Harasim, 1991; Henri, 1992). Socioemotional processes are at the base of group forming, the

establishment of a normative and affective structure, and the emergence of group dynamics (Forsyth, 1990). Hooper and Hanafin (1991) found that in achievement differences in groups "the nature of intra-group cooperation is potentially of greater importance than group composition per se" (p. 28).

Gilbert and Moore (1998) argued, "Social interaction between students and teachers and between students and students can sometimes have little to do with instructional learning, but can still help to create a positive (or a negative) learning environment'' (p. 30). Similarly, Northrup (2001) contended that through social interaction

> The opportunity for learning more about peers and connecting them in non-task, specific conversation is more likely to occur. Although social interaction may have very little to do with a course, it is still valued as the primary vehicle for student communications in a Web-based learning environment. (p. 32)

Rovai (2001) lent support to these hypotheses when he found evidence that "community was stronger in the program that provided learners more and diverse (non-task) opportunities to interact with each other and that the most important community components in which groups differed were spirit and trust" (p. 105). In summary, the presence of non-task contexts positively influences the building of an affective structure and thus the building of learning communities. However, contemporary collaborative/cooperative environments usually do not provide such non-task contexts.

Zhang and Fulford (1994) distinguished interactivity that relates to learner–content interaction and interactivity that relates to social interaction outside the instructional context (social interaction in the social/psychological dimension). This corresponds with the two dimensions of social interaction proposed by Kreijns and colleagues (2003). Gilbert and Moore (1998) used the term social interaction for the socioemotional and affective exchanges between learners in the task context and

instructional interaction for learner–content interaction. They stated, "It is important to distinguish between interactivity which is primarily social in nature and interactivity which embraces key instructional objectives'' (p. 31), confirming Zhang and Fulford.

If social interaction exists in both dimensions, collaborative learning will yield benefits by increasing participants' efforts to achieve, promoting caring and committed relationships, and increasing participants' psychological health and well-being (Johnson & Johnson, 1992. 1994).

Throughout the years, a number of meta-analyses have examined the effectiveness and the benefits of collaborative/cooperative learning. Johnson, Maruyama, Johnson, and Nelson (1981) found that collaborative instructional methods in 122 studies were more effective in promoting student achievement and performance in all subject areas; all age groups; and tasks involving concept attainment, verbal problem solving, categorizing, spatial problem solving, and guessing-judging-predicting than both competitive and individualistic instructional methods. After participating in a cooperative activity, students should accomplish the same kind of tasks by themselves. They learn to do something together so that they can do it better when they are alone.

According to Johnson and Johnson (1986), there is strong evidence that cooperative teams achieve higher levels of thought and retain information longer than students who work quietly as individuals. The shared learning gives students an opportunity to engage in discussion, to take responsibility for their own learning, and thus to become critical thinkers (Totten, Sills, Digby, & Russ, 1991).

Kreijns and colleagues (2003) noted that task orientation is also important for collaborative learning groups to be successful. However, solely focusing on task orientation in collaborative encounters may impede the development of social relationships and the creation of a sense of cohesiveness and community (Harasim,

1991; Henri, 1992). Socioemotional processes are at the base of group forming, the establishment of a normative and effective structure, and group dynamics (Forsyth, 1990). Hooper and Hanafin (1991) found that in achievement differences in groups "the nature of intra-group cooperation is potentially of greater importance than group composition per se" (p. 28). The social dimension of collaborative learning is therefore critical to a team's effectiveness and may be related to team members' sense of engagement in the learning process—flow.

Effectiveness of Cooperative/Collaborative Learning in Higher Education

Studies have shown the positive effect of cooperative learning in student achievement, as measured by test scores. Recent research has focused on understanding how students at different levels of academic achievement experience various instructional activities and how these experiences effect student motivation. The role of student personal characteristics has also been of research interest in understanding student preferences and attitudes toward various instructional activities and environments.

Peterson and Miller (2003) recently studied the quality of student experience during cooperative learning within a large group instruction setting. They found that the overall quality of experience was greater for thinking on task, student engagement, and perception of task importance, and optimal levels of challenge and skill were achieved. In other words, flow was achieved—a measure and concept taken from the work of Csikszentmiyalhi. Teams can experience in their work a state of Flow and once intensely engaged –in flow- achieve the synergy of their common effort and become highly productive and creative, they achieve Team Synergy.

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DEFINITIONS OF FLOW

The process of optimal learning experience has been called flow and can be experienced when both challenges and skills are high, and the person is not only enjoying the moment, but also stretching his or her capabilities with the likelihood of learning new skills and increasing self-esteem and personal complexity (Csikszentmihalyi & LeFevre, 1989).

Flow theorists have described the optimal or quality experience as "the holistic sensation that people feel when they act with total involvement" (Csikszentmihalyi, 1990, p. 36). In the flow state,

> players shift into a common mode of experience [as] they become absorbed in their activity. This mode is characterized by a narrowing of the focus of awareness, so that irrelevant perceptions and thoughts are filtered out; by loss of self-consciousness; by responsiveness to clear goals and unambiguous feedback; and by a sense of control over the environment...it is this common flow experience that people adduce as the main reason for performing the activity. (Csikszentmihalyi, 1990, p. 72)

Csikszentmihalyi (1990) asserted that this state of intense involvement, or flow, is experienced when people are engaged in an activity they perceive as challenging and for which they have appropriate skills to meet the challenge (high challenge and skill). When either high challenge or high skill is not present, three other possible motivational conditions occur based on the ratio between challenge and skill: anxiety (high challenge and low skill), boredom (low challenge and high skill), and apathy (low challenge and low skill).

More recently, flow was described as a state of mind sometimes experienced by people who are so deeply involved in an activity that their attention is focused on the

present, and they forget about other irrelevant thoughts and lose track of time (Csikszentmihalyi, Rathunde, & Whalen, 1993).

> Flow [is] defined as an intrinsically enjoyable experience, [and] is similar to both peak experience and peak performance, as it shares the enjoyment of valuing of peak experience and the behavior of peak performance. Flow per se does not imply optimal joy or performance but may include either or both. (Privette & Bundrick, 1987, p. 316)

Flow in cooperative learning relates to the dimension of challenge in relation to skill, a cornerstone of the quality of a learning experience in flow. Students' perceived levels of challenge in relation to skill, allows them to engage in tasks that are bigger than what a single person can accomplish.

> The greater opportunity to experience flow during cooperative learning is important, since flow has been associated with higher levels of concentration, enjoyment, happiness, strength, motivation, self-esteem, and perceived task importance among teenagers. (Csikszentmihalyi & Schneider, 2000, p. 13-14)

Results suggest that cooperative learning with undergraduate students can lead to greater cognitive involvement; somewhat greater activation; and higher levels of motivation, including higher engagement, greater perceived importance of the tasks, and more optimal levels of challenge in relation to skill (Peterson & Miller, 2003). In addition to being more engaged during cooperative learning, students perceived that their learning task during cooperative learning was more important than during large-group instruction. College students' experiences were compared during cooperative learning, borrowing from Csikszentmiyalhi's work on flow as a measure of the quality of the learning experience. As Csikszentmiyalhi (2000) pointed out, being in flow offers the maximum opportunity for students to enjoy challenges that will help them reach their future goals.

Another study used Csikszentmihalyi's flow theory (1990) as a theoretical framework for examining the quality of high school students' experiences during various learning activities in their classes, including lecture, TV/videos, small-group work, individual work, and tests/quizzes (Csikszentmihalyi & Schneider, 2000). Csikszentmihalyi and Schneider found that students reported more enjoyment of group work, although their differences were not statistically significant. In contexts where small-group activities do not provide authentic experiences for students, they are more likely to be perceived as "busy work." For example, in the Csikszentmihalyi and Schneider study, students perceived individual work and tests as more important to their future goals than group work.

Over the past 20 years, numerous researchers have attempted to measure flow with questionnaires and event monitors covering a wide variety of activities, including composing music, sports, work, hobbies, and computer usage. Of interest to this study is measuring flow specifically for the behavior of students in teamwork. For this study measurement, efforts of flow build upon previous research by operationalizing flow in a questionnaire that contains aspects of flow in behaviors that occur during teamwork.

Assessment of Collaborative/Cooperative Learning Teamwork

Assessment is a process of reflection and traditionally has been in the hands of the instructor. The shift in the student and instructor roles indicates the need for a shift in assessment practices and the need for students to become reflective practitioners. The view that assessment of student achievement should be conducted at the end of a learning process is no longer tenable. Researchers have developed and studied new forms of assessment in higher education collaborative learning environments.

There seems little argument about the value of teamwork, but its assessment has proved considerably more problematic (Conway, Kember, Sivan, & Wu, 1993; Lejk, Wyvill, & Farrow, 1996). Research has shown that the nature of assessment tasks influences the approach that students adopt to learning. Traditional assessment approaches can have effects contrary to those desired (Beckwith, 1991). Assessment practices increasingly must include various kinds of assessments in which students have to interpret, analyze, and evaluate problems and explain their arguments.

Together with the change in views of learning, teachers and researchers need to change the traditional test culture and adopt a formative assessment approach that is reflective and performance oriented. As mentioned earlier in the review of the characteristics of powerful learning environments, reflection opportunities are an important element of powerful learning. Assessment is now conceived as a tool for learning (Dochy & McDowell, 1997). Assessment procedures need not only serve accreditation goals but also can help students monitor their progress with the purpose of directing students to remedial learning activities if needed.

De Corte (1996) connected the characteristics and the design of powerful learning environments to reflective processes and monitoring strategies in small groups and their role in initiating external regulation. When monitoring is encouraged, a classroom culture is achieved that encourages reflection on the process, critical thinking, and personal investment in one's own learning. From the Sampson, Cohen, Boud, and Anderson (1999) perspective, if courses include objectives about students' capacity to work as part of a team, and teacher's value peer learning and collaboration, some means of assessing teamwork in a fair and meaningful way that promotes peer collaboration is necessary.

Assessment activities are changing from a status where students passively undergo testing and measurement, where decontextualized subject matter unrelated to the students' learning experiences is tested, and where measurement is solely in the form of a single total score (Wolf et al., 1991). Assessment activities are now integrated practices that use various kinds of assessments in which students have to interpret, analyze, and evaluate problems and explain their arguments.

Boud (1990) stressed that assessment practices in higher education have to be compatible with the curricular goals. Educational innovations, such as problem-based education, project-oriented learning, and competence-based education, need new forms of assessment, whereby assessment and learning are strongly interconnected in the course materials. In these didactic forms of collaborative learning, it is often difficult for the instructor to effectively monitor and assess the contributions and level of participation of individual members of a team. Students often enjoy learning in teams and developing teamwork skills, but criticize team assessment as unfair if team members are rewarded equally for unequal contributions.

Instructors need peer- and self-assessment tools to support self-monitoring and peer-group assessment; these tools would allow instructors to have a special window to the performance of students as experienced from both the self and the team perspective.

Boud and Falchikov (1989) defined self-assessment as the involvement of learners in making judgments about their own learning, particularly about their achievements and the outcomes of their learning. Sluijsmans and Moerkerke (1999) expanded the Boud and Falchikov description, defining self-assessment as learners taking responsibility for monitoring and making judgments about aspects of their own learning. It requires learners to think critically about what they are learning to identify appropriate standards of performance and to apply them to their own work.

The power of self-assessment lies in an individual's reflection on his or her own activities and performance in the same way as (s) he reflects on those of his or her peers. Reflection opportunities result in growth. With peer-assessment, individuals receive valuable feedback on their performance and contributions to the team so that they may compare the team's perceptions to their own self-assessments. The more quickly they receive feedback, the better they will feel about the process and themselves.

The review of self- and peer-assessment research supports the value of integrating self- and peer-assessment in higher education learning processes. Assessment procedures should be developed with high consequential validity that encourage deep approaches to learning and have a positive impact on the competencies and skills students develop (Boud, 1995). Sobral (1997) also pointed out the relationship between reflection and self-assessment. Self-assessment of self-directed learning supports reflection and learning partnerships and is facilitated by discussions and exercises.

Self-assessment schedules are effective tools in enabling students to bring together a wide range of their learning, to reflect on their achievements, and to examine the implications for further learning (Boud, 1992; Boud & Knight, 1994). Longhurst and Norton (1997) stated that self-assessment is clearly an important part of helping students to improve their own learning as it focuses student attention on the metacognitive aspects of learning and teaches students to be more effective at monitoring their own performance.

Employers want evolving, self-reflexive employees who are able to deal with weaknesses as appropriate. Thus, students need to develop self-assessment skills and the ability to give and receive feedback from peers on real work performance.

Assessment in actual working environments occurs in situations where knowledge is used. Learning to engage in self- and peer-assessment will close the gap between what is required of students in higher education and what is required of them in real-life work (Boud, 1990). The dividends of making self- and peer-assessment effective in high education will be far reaching because employment at a professional level usually requires specialized knowledge (Adams & King, 1995); an important part of using such knowledge is the ability to have a continual understanding of one's own characteristics, capabilities, and limitations.

Individual Characteristics

Differences in ability, social interaction skills, and self-management are common in collaborative learning as well as in other learning contexts. There is a need to understand better the nature of the personal characteristics that make people effective in learning teams.

In human society, teamwork among adult learning and working groups is extremely important. As mentioned earlier, some of the important personal attributes college graduates need to be successful in a modern, rapidly changing society are flexibility and skills in teamwork and negotiation (American Council on Education (ACE), 1997).

It is important to understand the personal characteristics that make better team players in the new learning environments that use new ways of teaching and learning and are more in tune with current understandings of learning in social interaction. Hartley and Bendixen (2002) argued that it is essential to better comprehend how learners' characteristics impact their ability to succeed in environments that are very different from traditional learning situations.

Team members come to work together with individual differences that determine how they interact and work to achieve team goals. This makes it important to study personal characteristics related to teamwork as the successful attainment of tasks and positive social interaction in a learning community. It is important to understand how personal characteristics related to teamwork evolve and whether they are given by nature and biology or acquired by the nurturing influence of family environment and culture. The next section examines the evolutionary, sociological, and psychological perspectives of the gender role behaviors of masculinity and femininity as they relate to teamwork behaviors.

EVOLUTIONARY PERSPECTIVE

Recently, Berman (2003) has studied personal characteristics of masculinity and femininity related to teamwork from the evolutionary perspective. A general rule of nature is that form and function go together. As humankind continues to evolve and women's roles in society change, males are evolving from bullies to less dominant, more nurturing team players, characteristics that enable cooperation between males and females. Berman stated evolution is shifting the average brain's masculinization to a lower degree, and a great many males are "born gentlemen." They do not have to learn to be gentleman. They enjoy being gentleman (Berman). Berman's low masculinization perspective holds that, during prenatal development,

> Resistance to brain masculinization serves to reduce the psychological
> differences between male and female, to tone down the gender differences that
> prevailed in prehistoric times, to make the average male less macho and more of
> a gentleman in his way of thinking, feeling, and behaving. Low masculinization
> transformed males from bullies to team players and from harem chiefs to
> *partners in parenthood*…it made it possible for the human species to produce

poets and philosophers, scientists and engineers, saints and scholars, dreamers as well as men of action (p. 21)

Extending Berman's (2003) theory to the world of work, males with a low masculinization influence on their brains will exhibit gentle, nurturing, and collaborative behaviors in teams. As there is no need to fight for territory or a harem of females, masculinity in modern times is reflected in relative cultural emphasis given to goals related to productivity, femininity, and quality and harmony of interpersonal relationships.

SOCIOLOGICAL AND PSYCHOLOGICAL PERSPECTIVES

Personal characteristics have been studied from different perspectives in the fields of sociology and psychology. Two characteristics that may be related to teamwork are the constructs of agency and communion.

Agency and Communion. Agency and Communion can be found in social science writings. Wiggins (1991) developed taxonomy of ideas about agency and communion. Wiggins' conception of agency involves power, mastery, and assertion. The opposite of agency is passivity, which involves weakness, failure, and submission. Communion involves intimacy, union, and solidarity. The opposite of communion is dissociation, which involves remoteness, disaffiliation, and hostility. Wiggins' placement of constructs under agency or communion is theoretical.

In western cultures, expectations of gender roles include the idea that males should be (a) self-reliant, (b) taught which emotions (anger and sexual desire) are acceptable to express, (c) taught which toys to play with, and (d) taught how to interact with others. The same teaching of expectations is at play for females. Broverman, Broverman, Clarkson, Rosenkrantz, and Vogel (1970) conducted original research that

demonstrated vastly divergent gender stereotypes; however, 30 years later, stereotypes and gender roles are converging in a number of domains. Within each culture, different roles or rules for appropriate behavior are defined, taught, and enforced. Gender-based roles in particular are influenced by basic learning mechanisms, including being rewarded for performing gender-consistent behaviors and punished for performing counter-stereotypic behaviors. Learning also occurs by imitation of appropriate behaviors through watching or social learning processes (Bandura, 1977).

"Social roles are defined as the expectations placed upon a person because of their [sic] social category membership" (Kimble, Hirt, Diaz-Loving, Hosch, Lucker, Zarate, 1999, p. 333). The assigned roles, however, often carry with them expectations that are far more pervasive. Since the 1970s, researchers have tended to focus on two aspects of gender role socialization: agentic (so-called masculine) and communal (so-called feminine) personality traits. Earlier theories and their measurement tools emphasized the bipolar nature of the relationship between masculine and feminine traits as well as the strong correlation between biological sex and gender roles. Agentic traits are more stereotypically associated with men and men's roles in society, whereas communal traits are more stereotypically associated with women and their social roles.

Researchers thought certain traits were characteristics of each gender and represented the opposite sides of a continuum. Once gender role research demonstrated that the characteristics were present in different amounts in both genders, the concepts of masculinity and femininity evolved into "Instrumentality and Expressiveness. The behavior described was more in tune with self-assertion and goal-oriented behavior for Instrumentality and the conditions needed to promote the development of quality interpersonal relations on expressiveness. In summary, the concepts of Instrumentality and Expressiveness are based on earlier ideas of Agency and Communion

From the gender perspective, Constantinople (1973) and Bem (1974) presented Agency as Masculinity and communion as Femininity. Spence (1985) presents Agency as self-assertion or Instrumentality and Communion as Expressiveness (Wiggins, 1991.). Contemporary gender role theories and their measures treat these traits as both bidimensional (i.e., uncorrelated with one another) and relatively independent of biological sex, such that men and women internalize agentic and communal attributes (Constantinople, 1973; McCreary, Newcomb, & Sadava, 1998; Spence, 1991).

The two commonly used questionnaires are the PAQ (Spence et al., 1975) or the Extended PAQ (Spence, Helmreich, & Holahan, 1979) and the Bem Sex Role Inventory (Bem, 1974). These questionnaires have operationalized agentic or Instrumental gender role traits and communal or Expressive traits.

The PAQ developed by Spence et al. (1974) is a self-report questionnaire that asks respondents to indicate the extent to which they can be characterized in terms of various adjective traits. Thus, for example, respondents indicate, using a 5-point scale, the extent to which they see themselves as independent.

The PAQ short version of the questionnaire consists of 24 items. Eight items represent characteristics that (a) men are stereotyped to possess to a greater extent than women do, and (b) are seen as desirable qualities for both men and women. Masculinity, as defined by the PAQ, means being self-assertive or Instrumental. The following items represent the construct Masculinity (Instrumentality): independent, active, competitive, can make decisions easily, never gives up easily, self-confident, superior, and stands up well under pressure. Items selected by Spence and Helmreich to represent traits of Femininity (Expressiveness) are emotional, able to devote self completely to others, gentle, helpful to others, kind, aware of feelings of others, understanding of others, and warm in relations with others.

The world of work shared by modern men and women requires the exercise of instrumentality to achieve success in their professional activities. The maintenance of satisfying personal relationships is also important. For relationships to be satisfactory, empathy and positive expressiveness that engages in peaceful, constructive interaction and promotes the well-being of others is required. All these characteristics represent the sine qua non ingredients of successful interaction and attainment of the group's common goals.

In teams the idea of "one for all and all for one" implies being accountable for the timely quality task contribution of each member to the team project. Beyond the task accomplishment, of crucial importance is quality social interaction that leads team players to walk the extra mile and do their utmost effort.

Quality interaction depends on a variety of social skills, like the ability to see with positive regard the uniqueness of teammates; the ability to be gentle, kind, and warm; and the ability to trust and share information about oneself, one's own story, one's points of view, and one's resources and skills in order to help others. It is also important to negotiate and communicate needs and be willing to receive help on shortcomings. All these social skills provide an environment where the team comes together to have fun and enjoy each other's company in the process of learning together. As stated by Johnson and Johnson (2000),

> Teams not only meet to share information and perspectives and make decisions they produce primarily because they are accountable to do what they commit to do to contribute to the team. In the process, teams enjoy the social interaction and team members hold themselves and each other accountable for doing high-quality work. (p. 540)

In addition, as Swann (2003) recently said in an interview about findings of a study conducted with business students in The University of Texas at Austin,

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What you really need to do is see group members as individuals….By recognizing people for who they are, we communicate that we appreciate them as individuals and that may increase their willingness to come forward with creative ideas. If you feel that your fellow group members have an understanding of who you are, it may give you more license to take risks and generate creative ideas that increase workplace productivity (parog. 10).

Characteristics and Assessment of Effective Teamwork

Differences in ability, skills for social interaction, and self-management are common in collaborative learning as well as in other learning contexts. It is important to better understand the nature of the personal characteristics that make people effective in learning teams. As documented above, two dimensions of teamwork performance need to be taken into account: (a) interaction to accomplish the team tasks, and (b) interaction to develop and maintain the social community. Social interaction encompasses all interactivity between team members, including casual conversations and task-oriented discussions. Rich learning environments provide adequate opportunities for genuine dialogue and social interaction, which is vital for the learning process.

The successful attainment of tasks and social interaction in the learning community requires different personal characteristics. Learning and working with other people has challenges due to individual shortcomings and the learning process of acquiring teamwork skills to join others to learn together. In the best-case scenario, positive social interaction leads to working together and becoming a learning community. The bonds that glue a community together are created through conversation in positive social interaction. A learning community builds reciprocity, shared accountability, trust, predictability, and social cohesion. Dialog creates plans to achieve group goals. In addition to positive interaction, timely performance of tasks is obtained,

and the group achieves its goals. However, not all teams achieve this level of performance. Often members do not accomplish what they are supposed to contribute; being accountable to the team influences timely team member performance.

Research in online collaborative learning teamwork has shown the importance of instrumentality to direct the behavior to the tasks that need to be accomplished for team goals and positive expressiveness to maintain the promotive social interaction of group work (Menchaca & Resta, 2002). A preliminary exploratory factor analysis of the TAS used in online collaborative learning teamwork revealed two factors that underlay the TAS. The factors were labeled Task Management and Social Interaction. The TAS was originally designed as a tool to provide students with formative assessment to help improve their collaboration skills. Originally, TAS consisted of 12 items. The reliability of each of the factors of the scale was above .90 for each factor when used with on- and off-campus graduate students.

TAS is an instrument developed to assist the process of reflection through repeated use during a semester. It is used for assessment of the self and peer Social Interaction, Task Management and Trust contributions to the team collaborative learning process. The original TAS was developed to assist students in the reflection process on their teamwork and to provide instructors with a window to monitor learner performance from the self and peer perspective. Based on research and item performance, new items were added to complement the original set and improve the measurement and the psychometric characteristics of the scale. It has not been used in face-to-face teamwork and its validity and reliability for this purpose remained to be determined.

Reflection and feedback to and from peers are important components of the group process as they contribute to accountability. When the process of learning to be

reflective practitioners was examined by the TAS in online collaborative learning groups, Menchaca, Resta, and Awalt (2002) found that students undergo a process of learning to conduct self- and peer-assessment.

Further research is needed to determine how teamwork abilities change over time when students are given the opportunity to work in collaborative learning teams. Researchers need to study how to cultivate the growth of behaviors that are related to teamwork skills, and how much each skill stems from personal characteristics like Instrumentality and Expressiveness, or gender and culture; these characteristics can be very important to facilitate becoming a high-performing learning team with the characteristics of Flow and Synergy. In addition, it is important to understand how the conditions of a powerful learning environment influence the development of teamwork skills, team productivity, and effectiveness. Members of a team vary in the amount of skills they have developed for task management and positive social interaction. Both skills are required for optimal teamwork.

It is important to understand which characteristics will distinguish those students likely to successfully achieve team flow from those who are less likely. It is expected that the study of the factors of Instrumentality and Expressiveness as antecedents of teamwork skills will advance understanding of skill development and the impact of rich learning environments that result in students' full engagement in their learning and the experience of team flow.

If TAS is a valid measure of the factors of Social Interaction, Task Management and Trust in teams, TAS may allow testing whether effective collaborative learning teamwork requires the joint contribution of task management, positive social interaction and trust. Whether these exploratory findings of the TAS on online teamwork hold in face-to-face teams and whether the factors underlying face-to-face teamwork are the

same as those found on online learning environments are questions of interest. It will be interesting to understand to what extent Task Management and Social Interaction factors may help predict team effectiveness and engagement as measured by "Team Flow" and whether teamwork factors relate to the personal characteristic factors of Instrumentality and Expressiveness. Team Flow for the purpose of this study is a process of optimal experience that occurs when teams participate in a highly challenging project. During team flow, the team project requires the use of members' skills, and team members are mutually engaged in collaboration; are intensely involved in their team activities; experience shared knowledge building; and is not only enjoying the process of teamwork, but also stretching their capabilities with the likelihood of learning new skills, especially learning to work in teams.

The purpose of this study was to examine the psychometric characteristics (validity, reliability and item characteristics) of the TAS and examine its relationships with established constructs such as Personal Characteristics of Instrumentality and Expressiveness and Team Performance in Team Flow and Team Synergy.

For evidence of the Validity and reliability of the TAS, Exploratory Factor Analysis (EFA) was used to find the constructs underling the scale, reliability was assessed by means of internal consistency and item correlations, Convergent and Discriminant validity was assed by correlations to examine if theoretically consistent relationships with related constructs of 1) Personal Characteristics of Instrumentality and Expressiveness and the TAS factors were present. A nomological network was used to examine the relationships between the TAS scale dimensions, and 1) Personal Characteristics of Instrumentality and Expressiveness and 2) Team Performance by Team Flow and Team Synergy. The nomological network provided additional evidence

for the criterion validity of the TAS constructs. Chapter 3 will explain the methodology

of this study.

CHAPTER 3

METHODOLOGY

This study of collaborative learning teamwork has come from an inductive research process where the pilot study started as an open-ended exploratory process of teamwork in online environments. From Trochim's perspective, "Inductive reasoning, moves from specific observations to broader generalizations and theories" (2000). Trochim described inductive research as beginning with specific observations and measures to detect patterns and regularities, the formulation of some tentative hypotheses, and the development of some general conclusions or theories.

Deductive reasoning indicates that previous observations of online teamwork led to hypotheses that may be confirmed in face-to-face teamwork interactions. As part of a recurrent cycle, patterns that the study may uncover in the data lead to develop new theories that will be tested later.

This study was a validation study of the TAS. It was designed to be a prediction study of Teamwork Performance as reflected in Team Flow and Team Synergy. According to Trochim (2000), a prediction study provides three types of information:

1. The extent to which a criterion behavior pattern can be predicted,

2. Data for developing a theory about the determinants of the criterion behavior pattern, and

3. Evidence about the predictive validity of the test or tests that were correlated with the criterion behavior pattern. (Planning a Prediction Study parog. 1).

Trochim (2000) defined validity as "the best available approximation to the truth of a given proposition, inference, or conclusion" (Measurement Validity Types, parog.

1)). To advance knowledge of teamwork in collaborative learning higher education environments, researchers need valid measures that can assist faculty and team members in developing teamwork skills. Construct and Criterion (Convergent, Discriminant) validity of the TAS will be addressed in this study.

Research Setting and Context

During the academic year 2003-2004, 512 volunteer participants were recruited from a large campus wide undergraduate class that uses teamwork for its main class project. The course was taught in a large public university in an urban setting located in the Southwestern United States.

THE COURSE GOALS AND OBJECTIVES

The course was designed to help students

1. Develop skills of producing, organizing, and analyzing data;

2. Sharpen problem-solving skills;

3. Understand the technology and issues of information systems;

4. Understand and improve the quality of students' communication skills;

5. Recognize and value the diverse contributions of all members of organizations; and

6. Develop an understanding of the impact of information technology in business.

THE COURSE FORMAT: TEAM PROJECT

The course was based on the concept that a student's ability to work as a team member is critical to success in the business world regardless of the field. Group work,

culminating in a Business Fair, was designed to strengthen the interpersonal and presentation skills of students via teamwork.

The culminating activity of the course was a Team Project presentation at a mock trade show held at the end of the semester to showcase the work of the participants. The event draws large numbers of local businesses and visitors to the campus each semester.

Each team in the course was faced with the challenge of developing a product and a booth that would best "sell" their product at the end of semester event. As students designed their product and booth, they had to keep all expenditures under $150 collectively for their team. Toward the end of the semester, each team submitted final documentation of all of their business dealings and plans demonstrating the research and application of theories presented in the course.

At the public presentation event, each "company" presented its product to business executives, professors, graduate students, and selected upper division business major judges. These judges considered how well the product could be utilized by their stores or companies and they also determined the level of success the groups had achieved in incorporating the course concepts into their presentation. Judge's evaluations were based upon the answers to the questions they posed to determine the group's ability to relate course topics such as statistics to their product or use of technology in their firm.

The ultimate purpose for the team work in the course was to offer participants an opportunity to learn and practice the course material in both a fun and interesting way. This format also provided students with smaller learning environments and study groups within the mega class and a forum for them to practice all of the course material. Finally, the team product presentation activity, provided participants with an

opportunity to network with real world businesses and to apply what they learned to the real world beyond the classroom.

The team project counted 40% toward the course grade and 20% of the points were assigned for individual participation in the team Business Fair project. In developing the team projects, specific roles were required to be carried out by individual members of the team. The main roles and duties of team members included:

Manager. Duties included leading team meetings, setting deadlines, overseeing timeliness of job completion, and making sure team members stay on task.

Product Development Coordinator. Duties included the original development of the design specifications for the new invention, new version of an existing product, or type of service in which the team decides to focus.

Resource and Development. Duties included details on how the original product could be expanded or improved in the future, given new technology or other factors.

Advertising. Duties included development of brochures or handouts for potential customers and product advertisements for newspapers or magazines and coordination with marketing to develop and advertise the company image, slogan, and key message.

Marketing. Duties included all the activities involved in buying and selling a product or service and developing a written outline of the marketing activities a business expects to complete during a period of time. Marketing answers questions such as who is going to buy. What do they want? Where will they go to get it? How much will they pay? How much will they buy? Who else sells it? How will we sell it better? and How much profit do you want?

Accounting. No extensive accounting knowledge was required to fulfill this role. Duties included keeping clear records of the team's spending and the money or supplies received from sponsors.

Trade Show Coordinator. Duties included management of the firm's overall presentation at the Business Fair and all of the factors that go into a successful presentation as well as coordination of the set-up and breakdown/clean-up of the firm's booth.

Product Manager. Duties included determination of proper product distribution, research of other firms in the industry or similar industries, and setting and justification of production levels.

Human Relations. Duties included coordination of communication and collaboration between group members, employee benefits packages, and employee and customer safety.

Public Relations. Duties included development of the firm's press releases, and managing the firm's relationship with customers and the community.

Legal. Duties included protecting the group's product by knowing the standards for the ethics and copyrights in the industry of the group's product and analyzing the cost of protection against lawsuits.

Communication. Duties included analyzing the networking activities of the team and organizing the team's efforts in networking with local businesses.

Chapter 5 presents a summary of the observations of the interactions and activities of selected teams as they carried out their project and learning activities.

Purpose of the Study

The purpose of this study was to examine the psychometric characteristics (validity, and reliability) of the TAS and examine its relationships with established constructs such as Personal Characteristics of Instrumentality and Expressiveness and Team Performance in Team Flow and Team Synergy.

This study tested the following assumptions with students working in face-to-face collaborative learning teams: (a) TAS measures Task Management, Social Interaction, and Trust in teams b) Personal Characteristics of Instrumentality and Expressiveness are related to Task Management, Social Interaction, and Trust and (c) Task Management, Social Interaction and Trust are related to Team Flow and Team Synergy.

Cronbach (1971) discussed validation as a process used by a test developer or test user to collect evidence that supports the types of inferences to be from test scores.

According to Cronbach and Meehl (1955)

> To validate a claim that a test measures a construct, a nomological net surrounding the concept must exist" that... relates (a) observable properties or quantities to each other; or (b) theoretical constructs to observables; or (c) different theoretical constructs to one another. ….the investigator who proposes to establish a test as a measure of a construct must specify his network or theory sufficiently clearly that others can accept or reject it" (p. 406).

Different aspects of validity have been defined. Crocker and Algina (1986) discussed three types of validation studies conducted to gather evidence of the usefulness of scores in addressing a specified inference.

> Content validity studies are used to assess whether the items in an inventory or test adequately represent the construct of specific interest. In other words: Can the researcher draw an inference from an examinee's test score to a larger domain of items like those that are on the test itself?

> Criterion-related validity, encompassing both predictive validity and concurrent validity, is studied in situations where a test user wants to draw an inference about a person's test score to performance on a real behavioral variable that has practical importance.

> Construct validity is studied when "the test user desires to draw an inference from the test score to performances that can be grouped under the label of a particular psychological construct" (Crocker & Algina, 1986, p. 218).

Research Questions

The study was guided by the following four research questions:

RESEARCH QUESTION 1:

Construct Validity I: Teamwork Factors

R.Q. 1. What are the factors that underlie collaborative learning teamwork as measured by the TAS?

RESEARCH QUESTION 2:

Teamwork Factors Internal Consistency Reliability and Item Analysis

R.Q. 2. What is the Internal Consistency Reliability of the TAS Factors: Task Management, Social Interaction and Trust?

RESEARCH QUESTION 3:

Construct Validity II: Convergent, and Discriminant Validity: Personal Characteristics and Teamwork

R.Q. 3. What is the relationship between the TAS, the PAQ, the TF and the TS?

RESEARCH QUESTION 4:

Criterion Validity: Personal Characteristics, Teamwork and Team Performance

R.Q. 4. To what extent does the Social Interactions Teamwork Model fit the data?

Research Design

This study was a cross-sectional descriptive study focused on the examination and measurement of face-to-face teamwork in a collaborative learning college setting. The study incorporated survey research, longitudinal observations of teams and interviews and focus groups at the end of the project. Personal Characteristics were entered as Teamwork antecedents and Team Flow and Team Synergy as the effect using self-report observations. Correlation methods were used in the study. Correlation studies help establish covariation of the variables of interest but do not infer causality. In favor of correlational studies conducted in field settings, Tunnell (1977) stated that researchers should strive for the most natural setting because personality characteristics and variables cannot be manipulated for ethical reasons.

Field settings allow the researcher to observe natural behavior while people are engaged in their normal activities; thus, results may be more generalizable to other everyday, nonlaboratory settings.

Self-report measures are used when variables are not directly observable. Self-report allows researchers to study attitudes, personal characteristics, attributions, or what is not externally observable at a certain point in time. Usually subjects indicate their behaviors or position in a scale.

External observation can be combined with self-report to extend the comprehension of a phenomenon. Subjects may not be able to self-describe accurately or may be motivated to not reveal their true attitudes, behaviors, or characteristics. The validity of self-report is uncertain unless external observers or reliable raters confirm the self-report measures. The accuracy of surveys depends on the accuracy of respondents' answers, and researchers have found considerable evidence that the

method of data collection affects the answers obtained (Tourangeau, Rips & Rasinski, 2000, p. 312).

Therefore, with all these considerations in mind, students were asked to allow the researcher to become an observer of their teamwork, and at the end of their project, to volunteer to participate in interviews and focus groups to enrich the interpretation of the data collected.

In this study, students in the course could select members to form a team of 9 to 12 students with whom they have already made the commitment to work as a team. Also students were randomly assigned to a team at the beginning of the semester. This type of assignment created two types of teams and was used to describe the sample. All team managers present in a session with the Teaching Assistant during the seventh week of the semester, were invited to participate in team observations and all students present in class the tenth week of the semester were asked to respond to the self-assessment questionnaires.

RESPONSE RATE

A high degree of participation was achieved. From 631 students registered in the course, 512 cases were collected. In any single class day a hundred students are absent, so the response rate was very high as very few students attending the class did not responded to questionnaires. Students also signed up in a list to allow the researcher to be present in their team meeting and observe their work. The team observation period took place during eight weeks.

SELECTION OF CASE STUDY TEAMS

In addition to the questionnaires, teams were selected after the initial visits for more in-depth study and more frequent observations during their meetings. The teams were selected based on observations of differences in social interaction and task management. Frequently teams met simultaneously and they were observed on a rotating basis and as time permitted.

In addition, and in order to clarify the interpretation of the data, selected interviews with key members of teams and focus groups were conducted with students drawn from different teams that were observed at the end of the semester to gain insights that assisted the interpretation of the quantitative data. The inclusion of focus groups allowed participants from different teams to interact and learn from each other's struggles to work in teams.

> Focus groups allow respondents to react to and build upon the responses of other group members. This synergistic effort of the group setting may result in the production of data or ideas that may not have uncovered in individual interviews. (Steward & Shamdasani, 1990, p. 16)

The purpose of the focus groups was to stimulate in-depth discourse from among selected group members regarding the perception of the difficulties they face while working in their team and to understand more in-depth how their personal characteristics interacted during their process of teamwork to achieve or not achieve Team Flow and Team Synergy. In addition, the experience of Flow and Synergy were discussed to seek a deeper understanding of its characteristics. The information was used to interpret findings of Research Questions 2, 3, and 4.

Focus group interviews were conducted in 2-hour, mixed-teams group sessions. The focus groups provided the opportunity for the study to achieve an in-depth understanding of student perceptions of the team experience.

Focus groups data collected was used to achieve a clearer understanding of findings from the data collected in the Teamwork and Team Flow and Team Synergy questionnaires.

Qualitative data are "detailed descriptions of situations, events, people, interactions, and observed behaviors; direct quotations from people about their experiences, attitudes, beliefs, and thoughts; and excerpts or entire passages from documents, correspondence, records, and case histories" (Merriam & Simpson, 1995, p. 157). Interpretation of quantitative data collected for the study questions and discussion of the statistical results was improved as a result. The information was also helpful to address student's needs to be able to work effectively in teams.

UNIT OF ANALYSIS

Research questions in this study were examined at the individual levels of analysis, from the self-assessment perspective and the team descriptions were made from the participant observer perspective and the students own voices.

Research Procedures

PARTICIPANT CHARACTERISTICS AND ASSIGNMENT TO TEAMS

Volunteer participants were recruited from a large campus-wide undergraduate course. Students were told that the study will help faculty to better assign students to teams in future courses and to assist students' teamwork skills development. The

volunteer sample was high as expected: 512 students were recruited in a semester of the 2003-2004 academic year. Information of demographic characteristics of the students was collected to describe the population and conduct studies in the future on the effects of gender, college level and ethnicity and types of team in which they were involved. Almost half of the students were self selected members of a team and the rest were randomly assigned by the instructor to form teams.

At the completion of the team project, selected students were individually interviewed and others participated in focus groups.

The data-collection process was conducted according to The University of Texas at Austin Protection of Human Subjects procedures and the Informed Consent Form. The course included an intensive component of ongoing support and assistance to the students while they developed their teamwork abilities. To ensure the confidentiality of the data, students participating in team observations agreed to let the researcher know in advance when the Instructor or the Teaching Assistants were going to be present in their team session to keep their participation in the study confidential. Therefore, for the protection of the subjects, the researcher was unable to examine the interaction of the students with the instructor and teaching assistants while they were involved in ongoing support and providing direct assistance to the teams.

SAMPLING DESIGN AND PROCEDURES

The selection of research participants, drawn from the specific population most pertinent to the study, came from undergraduate college students in a major public university. The participants were not randomly selected to attend the course from which they were recruited. A convenience sample was used.

The undergraduate-level course used in this study provided a semester long teamwork experience to students and was a unique opportunity to study teamwork with a large number of teams. The study participants were not a random sample of university students, but the students were members of a particularly large class with representation from many colleges on campus. Although random selection was not achieved in this study, the research participants may represent the larger group from which they are drawn, given the large number of students participating in the course.

It was expected that the demographic characteristics within each team was representative of the characteristics represented in the course where the teams were studied. Randomly assigning students to teams reduces the potential of differences between the teams prior to the teamwork experience. In this study, team assignment was used for descriptive purposes given that the analysis was made at the individual level and type of team is a team level variable.

DATA COLLECTION PROCEDURES

The study searched for evidence about the validity of the TAS to assess Teamwork. It examined Personal Characteristics as antecedents of Teamwork and the TAS ability to predict Team Flow and Team Synergy.

Students were asked to fill out questionnaires in a class session and they entered their responses in scantron sheets. Each team had an Id number and students entered their birth day which combined with their team number served as their id for the study.

Data was collected for statistical analyses with the individual as the unit of analysis from Self-assessment of (a) Personal Characteristics; (b) Teamwork; (c) Team Flow; and (d) Team Synergy and (e) basic demographic characteristics of gender,

ethnicity, and college level. In addition Team Type and Team Assignment were collected for other studies.

Appendixes A–D provide samples of the scales and interview and focus group questions

Data Analysis Procedures for Research Questions

In order to examine the constructs that undergird Collaborative Learning Teamwork and whether the hypothesized model provided a good fit to the data, a path analysis was conducted. Path Analysis describes how the data fits the model tested but does not conclude that one variable causes the other, the model fit provides support for the Nomological Network of Teamwork constructs. The data was submitted to SPSS (SPSS, 2003) and Mplus 3.0 (Muthen and Muthen, 2004), statistical analysis software packages, with the capability of handling Exploratory Factor Analysis, structural equation modeling and path analysis. The team observations were made to develop a deeper understanding of the meaning of constructs the scale measured. The quantitative data analysis was designed to address each of the following four research questions.

Research Questions

RESEARCH QUESTION 1
CONSTRUCT VALIDITY: TEAMWORK FACTORS

R.Q. 1. What are the factors that underlay teamwork as measured by the TAS?

Construct validity answers the question: Does this test or instrument really measure what it is intended to measure? Heppner, Kivlighan and Wampold (1992) stated: construct validity is "the degree to which the measured variables used in the

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study represent the hypothesized constructs" (p. 47). Anastassi (1986) agreed that construct validity subsumes both content validity and criterion-related validity requirements. Nunnally (1978) reported that "construct validity has [even] been spoken of as ... 'factorial validity' " (p. 111). As much as 50 years ago, this concept was acknowledged by Guilford (1946): "The factorial validity of a test is given by its loadings in meaningful, common, reference factors. This is the kind of validity that is really meant when the question is asked: Does this test measure what it is supposed to measure?" (p.428).

In order to answer this question, in this study, we were interested in finding out the factors of the TAS.

Data Analysis Procedures

Construct validation takes place when an investigator believes that his instrument reflects a particular construct, to which are attached certain meanings. So, in this study of Teamwork the focus is on:

What are the factors that underlie collaborative learning teamwork as measured by the TAS?

To answer Research Question 1 that explores the construct validity of teamwork, TAS self-assessment data was analyzed by Exploratory Factor Analysis. Research question 1 about the TAS Construct Validity, related "(a) observable properties or quantities to each other"; via exploratory factor analysis (EFA) using the SPSS program (SPSS, 2003), to establish the teamwork factors or constructs present in this sample of face-to-face Collaborative Learning teams.

Factor Analysis

Factor analysis is a data reduction technique for identifying the internal structure of a set of variables. For Kerlinger (1979): "Factor analysis is an analytic method for determining the number and nature of the variables that underlie larger numbers of variables or measures" (p. 180). … factor analysis tells the researcher, in effect, what tests or measures belong together--which ones virtually measure the same thing, in other words, and how much they do so" (p. 180). Kline (1994) defined a factor as a "dimension or construct which is a condensed statement of the relationship between a set of variables" (p. 5).

A factor is a hypothetical construct that talks about what the variables have in common. Factor analysis is based on the scores of a number of individuals in a certain number of measurements. It is a set of procedures aimed at estimating the loadings of the items or variables that underlie a hypothetical construct, scale, or measuring instrument. Through a correlation matrix, the analysis identifies clusters of variables or factors with the purpose of conducting an orderly simplification of the group of measurements. Items within a factor are highly correlated with each other, and they are not correlated with items from other factors. Items are identified as belonging to a factor based on their correlation with that cluster of items.

The factor loadings, represented by the correlations between the variables, are the index of the construct validity. Rotation allows the simplest solution among a variety of solutions that may be compatible with the data.

Factor analysis can be exploratory or confirmatory.

Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) is a tool for use in the evaluation of score validity, particularly in reference to construct validity, that seeks to uncover the underlying structure of a relatively large set of variables. The researcher's *à priori* assumption is that any indicator may be associated with any factor.

Stevens (1996) describes the difference between two types of factor analyses, EFA and CFA: The purpose of Exploratory Factor Analysis is to identify the factor structure or model for a set of variables. This often involves determining how many factors exist, as well as the pattern of the factor loadings EFA is generally considered to be more of a theory-generating than a theory-testing procedure.

Factor analysis assumes that the observed (measured) variables are linear combinations of some underlying source variables (or factors). That is, it assumes the existence of a system of underlying factors and a system of observed variables. There is a certain correspondence between these two systems and factor analysis "exploits" this correspondence to arrive at conclusions about the factors. (Kim, 1986, p. 8)

In contrast, Confirmatory Factor Analysis (CFA) is generally based on a strong theoretical and/or empirical foundation that allows the researcher to specify an exact factor model in advance. This model usually specifies which variables will load on which factors, as well as such things as which factors are correlated. It is more of a theory-testing procedure than is EFA (p. 389).

Principal Components Analysis (PCA)

There are different methods of extracting the factors from a set of data. Principal Components Analysis (PCA) is a form of factor analysis which "seeks a linear combination of variables such that the maximum variance is extracted from the

variables. It then removes this variance and seeks a second linear combination which explains the maximum proportion of the remaining variance, and so on. This is called the principal axis method and results in orthogonal (uncorrelated) factors. PCA analyzes total (common and unique) variance" (Garson, 2004).

PCA provides the set of factors which can account for all the common and unique (specific plus error) variance in a set of variables.

Factor Analysis Decisions

Factor analysis confronts the researcher with the need to make some decisions. Several criteria were used to decide which factor solution provided with best solution for the data (Dunteman, 1989: 22-3).

First the eigenvalues were examined. The eigenvalue for a given factor measures the variance in all the variables which is accounted for by that factor. The ratio of eigenvalues is the ratio of explanatory importance of the factors with respect to the variables. If a factor has a low eigenvalue, then it is contributing little to the explanation of variances in the variables and may be ignored.

Next the Scree plot was used to determine the number of factors to extract. Cattell's scree test plots the components as the X axis and the corresponding eigenvalues as the Y axis. As one moves to the right, toward later components, the eigenvalues drop. When the drop ceases and the curve makes an elbow toward less steep decline, Cattell's scree test says to drop all further components after the one starting the elbow.

Finally the clarity and comprehensibility of the factor solution was used to select the number of factors to those whose dimension of meaning is readily comprehensible. This was used in conjunction with the examination of the scree plot. Further explained

on Chapter 4. Other possible criteria that were not used were the Kaiser criterion/rule which is to drop all components with eigenvalues under 1.0 or the rule of keeping enough factors to account for 90% (sometimes 80%) of the variation.

Factor Interpretations and Labels

The next important step in factor analysis is the labeling of the factors. The researcher received the assistance of additional experts in the area (Johnson-Houlbec, Reyes, 2003). Factor interpretations and labels must have face validity and/or be rooted in theory. It is notoriously difficult to assign valid meanings to factors. A recommended practice is to have others not otherwise part of the research project assign one's items to one's factor labels. Fellow research associates and colleagues examined the items.

Factor Analysis Assumptions

Assumptions of factor analysis are that outliers are not present; as with most techniques, the presence of outliers can affect interpretations arising from factor analysis. Interval data is also assumed as it is the case with Likert type scales where the scale measures the extent to which a person agrees or disagrees with a question. Linearity is assumed as Principal Components factor analysis is a linear procedure. As factor analysis is based on correlation (or sometimes covariance), both correlation and covariance will be attenuated when variables come from different underlying distributions. Moderate to moderate-high intercorrelations are also required as some researchers require correlations > 3.0 to conduct factor analysis. The data met the assumptions.

The factor analysis conducted in this study to answer question one, was an exploratory factor analysis that went through several cycles to obtain a shorter version

of the scale with optimal factor loadings as further detailed on page 97. Final results of the shorter version of the TAS containing items that load high according to the Stevens (1996) criteria in each of the factors will be presented in the results of research question 1. For research questions 2, 3, and 4, the factor scores were calculated using the 28 items of the TAS.

RESEARCH QUESTION 2
INTERNAL CONSISTENCY RELIABILITY AND ITEM ANALYSIS: TEAMWORK FACTORS

Research question 2 examined the Reliability of the TAS. Reliability is not a goal we seek as separate from validity. Reliability is inextricably linked to validity as we seek to authenticate the quality of our work.

R.Q. 2. What is the Internal Consistency Reliability of the TAS Factors: Task Management, Social Interaction and Trust?

For reliability of the 28 items TAS, the Cronbach alpha was used to demonstrate internal consistency of items within each factor. The Cronbach alpha provided additional evidence that the items within a factor were measuring the same underlying construct.

From the analysis of pilot data of collaborative learning teams it was expected that two factors will be found in the face-to-face teamwork data: Social Interaction and Task Management and that the new items formed a new factor, Trust.

RESEARCH QUESTION 3 CONSTRUCT VALIDITY II-

CONVERGENT AND DISCRIMINANT-: PERSONAL CHARACTERISTICS AND TEAMWORK

Research Question 3: Personal Characteristics & Teamwork

R.Q. 3. What is the relationship between the TAS and the PAQ?

Teamwork Construct Validity -Convergent and Discriminant- was examined by means of correlations between the TAS factors and Personal Characteristics of Instrumentality and Expressiveness. Criterion Validity can be Convergent or Discriminant. Also Criterion Validity can be Concurrent or Predictive dependent on when the observations are made.

Convergent validity. For convergent validity, the correlation coefficient was examined between the following factors: First an analysis of (a) PAQ Instrumentality and TAS Task Management and (b) PAQ Expressiveness and TAS Social Interaction and (c) Expressiveness and Trust.

Discriminant validity. Discriminant validity assesses if the way in which each one of the dimensions in this study diverges from other that it should not be similar. For discriminant validity, the correlation coefficient was examined between the following factors: (a) PAQ Instrumentality and TAS Social Interaction, (b) PAQ Expressiveness and TAS Task Management and (c) Instrumentality and Trust.

It was expected that the correlations between (a) Instrumentality and Task Management, (b) Expressiveness and Social Interaction and (c) Expressiveness and Trust will be higher for convergent validity of the TAS, and the correlations between (a) Instrumentality and Social Interaction and (b) Expressiveness and Task Management (c) Instrumentality and Trust will be lower for discriminant validity of the TAS.

In order to establish convergent and discriminant validity of the TAS, the relationship of the TAS factors was examined in relationship to the PAQ. The PAQ is a widely used measuring instrument whose reliability and validity has been established in the literature. The PAQ, developed by Spence et al. (1974), is a self-report 24-item self-administered questionnaire using a 5-point Likert scale. It measures gender role

attributes: instrumental–agentic traits and expressive–communion traits. Psychological agency and communion are the most frequently used measure of gender roles, and are manifested in instrumental and expressive behaviors (see Appendix B). The M-F is a third scale of the PAQ that was not used given that is rarely used due to low reliability.

Research question 3 to assess "(c) different theoretical constructs to one another" analyzed by means of correlations between the TAS Trust, Social Interaction, and Task Management constructs with the related antecedent constructs of Personal Characteristics of Instrumentality and Expressiveness. As part of the Construct Validity study, Convergent and Discriminant validity were to be revealed if theoretically consistent relationships were found.

RESEARCH QUESTION 4
CRITERION VALIDITY: PERSONAL CHARACTERISTICS, TEAMWORK AND TEAM PERFORMANCE

Research question 4 also to assess "(c) different theoretical constructs to one another" examined by path analysis the nomological network between the TAS constructs of Trust, Task Management and Social Interaction, and 1) Personal Characteristics of Instrumentality and Expressiveness, and 2) Team Performance operationalized by Team Flow and Team Synergy. If team performance was predicted by the paths in the model, then evidence of Criterion Validity was revealed.

In order to examine if "(b) theoretical constructs are related to observables" pattern matching was also used to examine the evidence gather from the observations and interviews. Team case studies were followed up and studied in depth comparing the questionnaire data with the data collected during team observations, team members' interviews and focus groups contributions.

R.Q. 4. To what extent does the Social Interactions Teamwork Model fit the data?

For Research Question 4, Teamwork was a continuous variable. In the analysis, Team Flow and Team Synergy (the dependent variables) were predicted from Teamwork scores (a) Task Management and (b) Social Interaction and (c) Trust (IVs) and Personal Characteristics of Instrumentality and Expressiveness.

CONSTRUCT VALIDITY

Given that knowledge in collaborative learning environments is constructed through social experiences, the Social Interaction Model draws on Social Constructivism theory. Although other models may have superior fit, I was interested in testing a model derived from the Vygotsky's social constructivist paradigm which states that the higher psychological functions are of sociocultural origin (1978).

The Vygotsky socio-cultural perspective presents social interaction as a condition sine qua non for social learning. Social Constructivism emphasizes that learning takes place through interactions with other students and teachers and the world-at-large, and collaborative learning is predicated upon interaction (Harasim, 1989, p. 55) as we construct meaning actively and continuously in a social context (Young, 1997).

Agency is understood as power, mastery and assertion and Communion as intimacy, union and solidarity. Instrumentality refers largely to instrumental, agentic characteristics. Expressiveness was defined as socially desirable characteristics that refer largely to expressive, communal attributes. The Social Interaction Model, building upon previous online collaborative learning research findings (Menchaca and Resta, 2002), examines the relationships between the Teamwork components of Trust, Social Interaction and Task management, Personal Characteristics antecedents of

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Instrumentality and Expressiveness and their Teamwork performance outcomes in Team Flow and Team Synergy.

The Social Interaction Model hypothesizes Trust, as having a direct effect on Social Interaction and Social Interaction having a direct effect on Task Management. As noted by Forsyth (1990), the Social Interaction Model builds upon the importance of Socio-emotional processes that are at the base of group forming, the establishment of a normative and affective structure, and the emergence of group dynamics (Forsyth, 1990).

PATH ANALYSIS

Path analysis was used in this study to help the researcher examine if the Social Interaction Model, derived from theory, was consistent with the pattern of correlations found in the data.

Path analysis developed by Wright (1921), is an extension of the regression model. It is used to test the fit of the correlation matrix against two or more causal models which were compared by the researcher, and is one among a variety of currently used techniques for drawing causal inferences from non-experimental data. A regression is done for each variable in the model. The regression weights predicted by the model are compared with the observed correlation matrix for the variables, and a goodness-of-fit statistic is calculated. The best-fitting models are selected by the researcher for advancement of theory. In this analysis the model was tested at the individual level and the process indicated that the model fit very well the data.

It is important to remember that path analysis deals with correlation, not causation of variables. The arrows in the path model appear to reflect hypotheses about causation; however, many models may be consistent with a given dataset.

Path Analysis Assumptions

Path analysis requires the usual assumptions of regression. It is particularly sensitive to model specification because failure to include relevant causal variables or inclusion of extraneous variables often substantially affects the path coefficients, which are used to assess the relative importance of various direct and indirect causal paths to the dependent variable.

Independent or *Exogenus* and Dependent or *Endogenous* Variables

A path model is a diagram relating independent, intermediary, and dependent variables. Arrows indicate causation between exogenous or intermediary variables and the dependent(s). The main goal of a path analysis is to account for the covariances of observed *exogenous* and *endogenous* variables with a structural model of their presumed unanalyzed associations, spurious associations, and causal relations with each other. Independent or *Exogenus* variables receive no causal input and have no arrows pointing at them. Dependent or *Endogenous* variables receive one or more causal inputs. Causal effects can be either direct (e.g., X→Y) or indirect through mediating variables (e.g., X → Y_1 → Y_2) (Kline, 1998, p.146). A Direct effect represents the impact of one variable on another, with no mediation by any other variable; indirect effects operate through at least one intervening variable (Bollen, 1989).

In the path analyses conducted to examine relationships between the Independent or *Exogenus* variables Personal Characteristics of Instrumentality, Expressiveness and the Dependent or *Endogenous* teamwork variables: Positive Social Interaction, Trust and Task Management, and Team Flow.

Path Coefficients

A path coefficient represents the direct effect of one variable on another when all other variables are held constant, and can be viewed as a regression coefficient (Borg & Gall, 1983). The value of a path coefficient can range from -1.00 to 1.00, with higher absolute values indicating a stronger relationship. According to Cohen, J. (1988) Standardized Path Coefficients with absolute values less than .10 may indicate a small effect; values around .30 a medium effect and coefficients with absolute values of .50 or more indicate large effects. All three sizes of effects were found in the Social Interaction Model.

Path coefficients are called simply beta weights. A path coefficient is a standardized regression coefficient (beta) showing the direct effect of an independent variable on a dependent variable in the path model. Thus when the model has two or more causal variables, path coefficients are partial regression coefficients which measure the extent of effect of one variable on another in the path model controlling for other prior variables, using standardized data or a correlation matrix as input.

Path coefficients may be used to decompose correlations in the model into direct and indirect effects, corresponding, of course, to direct and indirect paths reflected in the arrows in the model. In general, any bivariate correlation may be decomposed into spurious and total causal effects, and the total causal effect can be decomposed into a direct and an indirect effect. The *total causal effect* is the coefficient in a regression with all of the model's prior but not intervening variables for x and y controlled (the beta coefficient for the usual standardized solution, the partial b coefficient for the unstandardized or raw solution). The *spurious effect* is the total effect minus the total causal effect. The *direct effect* is the partial coefficient (beta for standardized, b for unstandardized) for y on x controlling for all prior variables and all intervening

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variables in the model. The *indirect effect* is the total causal effect minus the direct effect, and measures the effect of the intervening variables. Where effects analysis in regression may use a variety of coefficients (partial correlation or regression, for instance), effect decomposition in path analysis is restricted to use of regression.

Maximum Likelihood (ML) Estimation

Model testing procedures included "Maximum Likelihood" (ML) estimation procedures. Maximum likelihood (ML) simultaneously estimates all model parameters. ML estimation was the default method in the MPlus. Maximum likelihood describes the statistical principle that underlies their derivation: if they (the estimates) are assumed to be population values, they are ones that maximize the likelihood (probability) that the data (the observed covariances) were drawn from this population (Kline, 1998, p. 125)."

Maximum Likelihood Assumptions

ML estimation is an iterative process that assumes multivariate normality of endogenous variables and exogenous variables that are continuous and it means: all the univariate distributions are normal; the joint distributions of any combination of the variable are also normal; and all bivariate scatter plots are liner and homoscedastic (Kline, 1998). The normality assumption does not apply to exogenous variables (e.g., gender, team type) that are dichotomous (Kline, 1998, p.127). So assuming linearity and residuals that are independent, normally distributed, and homoscedasticity with means of zero to test whether a regression (path) coefficient differs statistically from a value set to .05 for significance and bellow .01 for marginal or moderate significance.

ML estimation assumes multivariate normality, which means: all the univariate distributions are normal; the joint distributions of any combination of the variable are

also normal; and all bivariate scatter plots are liner and homoscedastic (Kline, 1998). Multivariate normality was checked through the inspection of univariate distributions. The data sets with absolute values of univariate skewness and kurtosis indexes can be described as normal (See Appendix F)

Fit Indexes

The Chi-square statistic is used to test for differences between the tested model and an alternative model that perfectly fits the data. Thus a non-significant Chi-square value indicates that there is no significant different between the fit of the tested model and a perfect model; that is if the Chi-square is non-significant, the tested model provides a good fit to the data. Most models tested on large samples are rejected given that Chi-square is a direct function of the sample size, "…the probability of accepting a model increases as N decreases" (Bentler and Bonett, 1980, p. 591). The Chi-square ratio reduces the effects of sample size (dividing the Chi-square by the degrees of freedom) in estimating the goodness of fit. Ratios below 2.0 are considered indicators of good fit (Byrne, 1989).

The Root Mean –Squared Residual (RMSR) reflects the average discrepancy between the matrices of sample data and the hypothesized model, with smaller discrepancies indicating better fit (Byne, 1989). Bentler and Bonnet (1980) have recommended that models of interest be tested against alternative models. Such a procedure allows the researcher to assess the relative predictive value of one model against another. A poorly fitted model may still account for more variance than alternative models. Recently Hu and Bentler (1999) suggested two combinational rules: a cutoff value of .96 for CFI in combination with SRMR>.09 resulting in the least sum of Type I and Type II error rates; RMSEA>.06 and SRMR>.09. According to Hu and

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Bentler (1999), "when N<250, the recommended combinational rules are more preferable because the rules tend to reject more simple and complex true-population models under the nonrobustness condition" (p.28).

The indexes of fit discussed above: Chi Square, RMSEA, CFI and SRMR were used to asses the fit of the model.

Instruments

For this research project, Teamwork was assessed with a modified Teamwork Assessment Scale, Personal Characteristics of Instrumentality and Expressiveness were assessed by the PAQ and Team Performance was measured by the Team Flow, and the Team Synchrony Scale. Next the instruments used are described followed by a section of the Researcher as Instrument.

TEAMWORK ASSESSMENT SCALE (TAS)

Teamwork, for the purpose of this study, was measured using the TAS scale, a paper and pencil instrument composed of 28 items that describe characteristics representing ingredients of successful social interaction that require positive expressiveness and empathy. These qualities that allow participants to engage in peaceful, constructive, satisfactory interaction for the achievement of group goals are:

1) Interpersonal behaviors that communicate respect, acceptance and willingness to work together, required for positive group interaction.

2) Team functioning skills and actions of leading, encouraging, sharing and helping others that result in the successful completion of team tasks.

3) Trust behaviors related to the attainment of the group's common goals that are necessary for successful achievement of task activities. These include interpersonal and positive communication skills and empathy that lead to getting to know and trust others and manage conflict. These qualities allow participants to engage in positive, constructive, satisfactory interaction. Trust behaviors are related to the attainment of the team's common goals necessary for successful achievement of task activities.

Teamwork was examined using the scores obtained in the TAS. The TAS was developed by De Hoyos & Resta (2002, 2004) for the purpose of this study to measure face- to-face teamwork. Originally, it was developed to assist students in an online graduate course with the process of reflection to measure the task management and social interaction contributions to the team collaborative learning process through repeated use during the semester. The instrument went from 12 to 14 to 16 items that operationalized the behaviors that represent ingredients of successful social interaction. The instrument is now composed of 28 items in the long version and 13 items in the short version, and has been adapted and used to measure face-to-face teamwork dimensions. The items use a 5-point scale, between the two extremes of *never* (A), to *always* (E) to reflect personal efforts and team contributions. Responses go from A for *never*, B for *seldom*, C for *sometimes*, D for *frequently*, or E for *always* (see Appendix B).

PERSONAL CHARACTERISTICS QUESTIONNAIRE

Personal Characteristics were measured using the scores obtained in the PAQ (Spence et al., 1975), used as a revised (Lenney, 1991) self-report assessment or peer-assessment measure of Instrumentality and Expressiveness and built on a 5-point Likert-type scale. Items were presented as words or phrases, and respondents were

asked to rate the extent to which each is item is descriptive of themselves, using 5-point interval scales, from 1= *never true of me* to 5 = *always true of me*. Cronbach alpha reliability coefficients showed adequate levels of internal consistency (men = .83, women =.77).

Instrumentality items presented in the M scale were found to refer largely to instrumental, agenetic characteristics. The adjectives and phrases that describe masculinity are independent, active, competitive, can make decisions easily, never give up easily, self-confident, superior, and stand up well under pressure. High scores are indicative of greater self-perceived Agency. For the factor of Instrumentality /Masculinity, scores of 1 represent lower instrumentality; scores of 5 represent higher instrumentality. From the scores of the questions a mean is calculated.

Expressiveness /Femininity items presented in the F scale were similarly defined as socially desirable characteristics that refer largely to expressive, communal attributes. High scores are indicative of greater self-perceived Communion. The adjectives and phrases that describe Femininity are emotional, able to devote self completely to others, gentle, helpful to others, kind, aware of feelings of others, understanding of others, and warm in relations with others. Scores of 1 represent lower expressiveness; scores of 5 represent higher expressiveness. From the scores of the questions a mean is calculated (see Appendix A).

TEAM FLOW (TF) AND TEAM SYNERGY (TS) SCALE

Team Flow is defined as a state of high-performance collaboration characterized by a sense of excitement, fun, and a high level of engagement of members of the learning team. Csikszentmihalyi and Lefebvre (1989) describe flow as a process of optimal experience that occurs "When both challenges and skills are high, the person is

not only enjoying the moment, but is also stretching his or her capabilities with the likelihood of learning new skills and increasing self-esteem and personal complexity".

Team Flow, for the purpose of this study, was defined as a process of optimal experience that occurs when teams participate in a highly challenging project where: the team project requires the use of high level skills, team members are mutually engaged in collaboration, are intensely involved in their team activities, experience shared knowledge building, and are not only enjoying the process of teamwork, but also stretching their capabilities with the likelihood of learning new skills- especially learning to work in teams.

Team Flow (TF) is an eight item self-administered scale. Team Flow was developed by De Hoyos, Dara-Abrams and Bischoff (2004) as a self-report Web Based measure which asks respondents to indicate the extent to which their experience of working with their team can be characterized in terms of experiences based on the Csikszentmihalyi concept of individual flow, transferred to the experience of teams.

Cronbach alpha reliability coefficients showed adequate levels of internal consistency for Team Flow = .83. Team Synergy is defined as the state of high performance evidenced by high levels of creativity and productivity (De Hoyos & Resta, 2004). Individual team member performance was measured by individual scores of each team member's contribution to a team product or performance. Cronbach alpha reliability coefficient showed adequate level of internal consistency for Team Synergy = .86 (see Appendix C).

Team Synergy is a seven items Web Based self-administered measure developed by De Hoyos and Resta (2004) to assess the experience present in teams described as the committed cooperative learning group that achieves high levels of creativity and productivity. It is based in Johnson & Johnson's concept of a truly committed team,

which, in their view, represents "the most productive tool humans have… but not all teams become high-performance cooperative teams that achieve higher levels of creativity and productivity" (Johnson & Johnson, 1998 p. 24). The experience is unique, rare and difficult to measure and is not a frequent experience. Cronbach alpha reliability coefficients showed adequate levels of internal consistency for Team Synergy = .86.

Both Team Flow and Team Synergy were integrated into a five-point interval Likert-type scale. Items were presented as noted above and respondents were asked to rate the extent to which each item is descriptive of their team experience. A 5-point scale will be used, with A= *never*, B = *seldom*, C= *sometimes*, D = *frequently* and E = *always* (See Appendix C)   High scores on Team Flow indicated a higher level of self-perceived Team Flow. Similarly, high scores on Team Synergy indicated a perception by the subject in the study of high levels of Synergy within their team. It was only possible to administer the instrument once during the study so further research is needed to determine the ability of the instrument to detect changes in student perceptions of their team over time.

Researcher as Instrument

The methodology chapter reviews the fact that in order to improve the validity and reliability of the study it is important for a qualitative researcher to describe his or her own background in terms of the topic of the research.

Inevitably, humans have biases that cloud and tint the way a research topic is seen. Next I will describe my life's experiences that are related to this research. This study is about students working in teams in collaborative learning environments. I have been a student for many years in which education and learning have played a very important role in my life.

The process that took me to this research was a long process of development. My parents placed education as one of the most cherished values at home as I grew up. It was so important for them that they moved from the area of their cities of origin, Monclova and Nadadores in the state of Coahuila, to Monterrey in the state of Nuevo Leon, so that they could have education available to their children.

In the 1920's my mother became a teacher trained in the then modern ways of teaching, which included a Montessori approach to teaching children. I remember the light in my mother eyes when she talked to me about what she learned about Maria Montessori while enrolled in her teacher preparation school in Saltillo, Coahuila. She transmitted to me the excitement of learning about new ways of teaching and learning.

As I grew up I was surrounded with more books than toys around my house. Some of the objects which I used to play with as a young child were, strangely enough, human bones. My brother was studying medicine and I was extremely interested in what was around me as part of my older brother's education such as the human skeleton. Medicine and the human body and mind were of great interest to me as I grew up. While I held the Cranium in my hands I wondered what was inside when that person was alive. It was a difficult decision for me: To study the body, or to study the mind. Both fascinated me. By high school I had chosen psychology and by the time I was 19, I had finished college and I went to work in the children's hospital. Research at the time had shown the importance of human touch in hospitalized children. The interplay between the body and the mind fascinated me.

When I was a child my grandfather, Adolfo Guevara, a physician who started his practice in 1901, came to visit us numerous times. He was a man that placed a high value in knowledge I remember that in his visits, the first thing that he would pull out of his suit pocket were tiny books full of stories, the size of his palm, that he had brought

for me as his present. I treasured these little books as a child. They got me hooked on reading and learning in life. My grandmother, Luisa Menchaca, also played a very important role in my life and instilled in me the love for books and her compassion for the sick and those that suffer. She was always ready to live and enjoy life and a new adventure. She loved to play and interact with everyone.

My grandmother taught me many things. As a child my grandmother was my playmate as she spent many days with me. She played all sorts of games with me and read me many kinds of books. Since my very first days of life I developed asthma. I was allergic to several things that my family did not know at that time. I was born in the winter and the covers my family had prepared for me were made out of wool, which as it turned out I was allergic to. So, from a very early age, I became an asthmatic child and was asthmatic until I reached puberty. This condition made me spend long weeks and days in bed with my grandmother next to me.

My love for learning and my love for experimentation and innovations were very much a part of my everyday growing-up process. I had the fortune of being born to a family with four older brothers, so when I was born it was a joy to the family. Since I was the fifth child and the first daughter for my parents, I was also the first and only grand daughter for my grandparents. I grew up in an environment where love and acceptance were present for me every day in the image I saw reflected in the eyes of all of those that cared for me. I am very lucky.

I had more books than toys around me as I grew up. My older brothers were always with their friends and classmates engaged in lively conversation with their books in their hands. I remember the bookshelves in my house reached the ceiling. Everyday I saw my brothers immersed in their books and in the evening with their friends in study teams inside the house or sitting outside the house. Since we lived in Monterrey,

Mexico where the climate was very hot, especially during the summer months, in the evenings my brothers and I would go out in front of the house and sit outside or on the street after 10 at night. The city was still peaceful during those years. There were very few cars at that time. I would go to bed and wake up the next morning and they would still be sitting in their chairs outside continuing with their immersion in their books and with their study group of friends. My brother, Evelio, was studying medicine and at that time the students needed to work in teams so that they could manage to learn the incredible amounts of details and the complexity of the anatomy and neuroanatomy and all the information of the medical sciences they had to learn in medical school. I saw them working in teams helping each other through the learning process. My brother' friends are now retired physicians. Two of my other brothers, Arnoldo y Gustavo, also worked with their teams. Not that studying medicine is different than studying something else, but the observation that made a strong impact in my life, while I was a young child, was of my brother Evelio and his friends, Mario and Aroldo, always sitting around in their small team rehearsing their concepts and teaching each other.

Like my brothers had done while I grew up, as a student I realized I learned more in conversation with others. I often had classmates coming over to study, just as I saw my brothers doing. Later on as a University Professor, group learning and active learning struck my intellectual curiosity and I began to ask questions about it. Do students learn better if they study together, or do they learn better when studying alone?

As time went by and I came across the concept of small groups for learning and working collaboratively, it all made sense - I saw it as an effective technique.

Learning in teams is also connected to technology and in the new ways of teaching and learning. My oldest brother, Luis(†) , was very interested in all sorts of new technology tools that were developing during his time. He was fascinated by the

inner contents of sound recorders, radios, TV's, you name it. Technology was his fascination. It made me wonder, what kinds of things can you do with technology? So I also became interested, after he led me on this path, to become involved with technology. When the opportunity to put together learning and technology came into my life, I just dove into it.

This is how collaborative learning and learning with technology developed as a special interest in me from a very young age, since my very early childhood beginnings.

Work teams have been very present in my life. My parents were a business team. While I was growing up, they had a laboratory in which they manufactured beauty products. I grew up playing chemistry in their business lab. It was really fun to do and learn how to do it.

Before they moved to Monterrey, my father had wanted to become a doctor and my mother wanted to be a nurse. Although my grandfather was a doctor, customs dictated their lives. During my mother adolescence, at the beginning of the past century, it was not proper for a young lady to pursue such a career like nursing. So my grandparents sent her to the state capital to study and she became a teacher. However, their love for medicine was always present in my parents' lives.

For my father, it was quite different. He wanted to study medicine as well, but when he was a teenager, the influenza epidemic broke out. The epidemic killed his brother, who was the father of three daughters, and other members of the family and many others in the community. Even though he was quite young, my father had to start working to help his brother's family.

He went to work in accounting for the city's store and his dreams of becoming a physician were never realized. When he married my mother and they went to live in a farming community which did not have good education establishments for my brothers,

my parents decided to move. In Monterrey, together they established the beauty products business, where I always saw them working as a team. My father had a high social intelligence and could deal very well with their clients. He was a great salesman that could sale anything because of the interaction he had with people. He cherished all of his relationships. He formed an intense and incredible positive relationship with all of his clients. I saw it first hand when the family accompanied him to the nearby cities and the border cities to visit them. They were his friends, he could sale them anything at the end of the visit. He considered his business visits not as such, but as a warm visit with a friend.

On the other side, my mother was the organizer. She was the business manager, in charge of all the employees working in the lab. She interacted with national and international suppliers that provided all the materials that the lab needed. She organized the production tasks of the employees as needed. Also, she planned in advanced for the seasonal demand and managed all that was required in the daily operations of the business. When it came to the accounting and financing part of the business, both my father and mother worked together. That was my example of partnership as I was growing up. I saw them leave to work together in the morning after dropping off my brothers and me at school. They were always together, day in and day out. They each had special skills and talents.

Later on in my own family life, I ended up also working in a team with my ex-husband. I got married at 18 and was married for 25 years. During those years, we taught together, gave presentations, and did therapy together as psychologists. We spent many years as a team, working side by side in public and as parents of our four daughters. We wrote a book together that sold 10,000 copies, we were on radio

programs, we wrote newspaper articles, appeared on local and national television, and spoke in public as a team.

There were weeks when we performed public presentations for more than 40 hours. As a result of the many hours that we gave presentations, the team that my ex-husband and I had formed was so finely tuned, that one could start a sentence and the other could continue the sentence with a smooth flow of ideas. We gave seminars that lasted all morning or all afternoon to large audiences, keeping the level of engagement and audience enjoyment high. The audience couldn't see where one idea ended and where the next one began. It was a continuous engaging of back and forth conversations and dialogue between both of us as presenters and with the audience. It was very powerful when we delivered any message due to the synchronization of our thoughts and ideas.

Teams have been continuously present in my life and of great interest to me throughout the years. I know that teams work and I know that teams achieve high performance. When the time came to do my dissertation, several questions had been boiling in my mind. What determines that you can work well with others? What are the key factors that build a high performing team? What conditions do you have to set in a learning environment so that students can experience the highest degrees of engagement and enjoyment? How can you help students acquire teamwork skills?

As I worked collecting data to answer my research questions, I had to use several of the skills that I had developed through a number of years of supervision, training and working with the deepest struggles of human life: the Alpha and the Omega. In the process of becoming a participant observer of the teams of my study, I reached to connect with the team members in our interconnection with the energy of the universe of which we are part.

This is where I came from when I went to conduct my case studies research with a skill to connect, to be aware and to understand the human experience of those students working in teams. My reading of their human experience reached a deeper lever than the words expressed, as sometimes silence speaks more then a thousand words if you can read what the non verbal behavior is telling you and the words that are kept unspoken. For sixteen years, I was a professor working with College students and before I go back to teaching, I wanted to know more of the new ways to facilitate my students' learning. Also as I am a student, I became a participant observer that did not provide a piece of writing of their manuscript or ideas to their product. Nonetheless, I gave them my full attention, experiencing being there to share what was going on in their process. I was able to experience with them their emotions derived from their interaction, the positive and the negative. This meant a high investment of my personal energy, being with and living through so many team projects. For an external observer, I was just sitting with the teams in their meetings. But inside I was experiencing with them and reflecting on their process to acquire a deep understanding of what they were going through.

I am a person that easily experiences empathy and unconditional acceptance and by becoming one with my teams as a participant observer I deeply accepted and cherished each one of its members and all those that allowed me to be with them. My energy was invested in all of them. Their success was mine and I rejoiced with them and for them. Their pain and struggle was also mine as I wished I could do more to help them than surrounding them with my spirit that cared so much for them.

When I report how I experienced the teams that were my case studies, keep in mind that my eyes and my being were of a researcher-international student-psychologist doing a participant-observation study of teams.

Procedures for Protection of Human Subjects

In order to protect the student's voluntary participation, neither the Teaching Assistants nor the Instructor knew whether or which subjects answered the questionnaires or which teams were participating in my observations. Results of the teamwork assessment scales were only available to the instructor after the grades were assigned.

Limitations and Weakness of the Study

This type of cross-sectional descriptive study, based on survey research, and longitudinal team observations, with interviews and focus groups at the end of the project, had several validity threats.

■History as events that were not part of the experimental teamwork treatment may have occurred during the weeks of the observation process and may have affected the teamwork process under observation.

■Maturation: Participants were college students undergoing the influence of rich learning environments that have a strong influence in accelerating intellectual and emotional changes. Students working in teams appeared to be strongly impacted by the experience. The questionnaire data reflects one point in time and different results may have been obtained if data from the beginning or the end of their work was collected.

■Instrumentation: Although the scale has good reliability, data for the study came from self evaluation and data provided by peers, the instructor or teaching assistants may have been a more reliable assessment of the students performance.

■Mortality: The teamwork process was highly demanding and two students dropped from one of the observed teams.

The following threats may have affected the external validity of the study:

■Testing-Treatment interaction: Students that answer the questionnaires may have been alerted to the issues under consideration in the team observations, and modified their interactions during my observations because they have been pre-tested.

■Selection-Treatment interference: The participants were not randomly selected to participate in the course and the teams observed were volunteer teams that responded to my request for participation. The sample was considered large and a high degree of participation was achieved, but the students in this course may have specific characteristics that make them different from the rest of students on their campus.

Specificity of the Variables: The circumstances of the team projects the students were engaged in represent a rich learning environment that may not be evident in other courses that use teamwork for their projects.

Experimenter Effects: It may be possible that the participant observation was a potential treat to the validity of the study as it may have disturbed the spontaneity of interaction among team members.

Reactive Arrangements: Students interactions with the researcher may have interacted or shaped the feelings and attitudes of participants involved during the course of the research process just by knowing that I was observing their interaction may have resulted in their trying to please me with what they may have believed that I wanted to see or hear.

RESEARCH VALIDITY AND RELIABILITY

Validity is "the best available approximation to the truth of a given proposition, inference, or conclusion" (Trochim, 2000). Validity of research is about the quality of different parts of a research methodology and can be examined from four types of perspectives: Construct, Conclusion, Internal and External validity. A theory (implicit or otherwise) exists when there is an investigation of what the cause is (the cause construct) on a known item, what the researcher is ideally trying to affect and measure (the effect construct).

To investigate a cause-and-effect relationship, four types of validity of the research methods for a question can be assessed. The present research study will be set to test the following assumptions with students working in teams: (a) TAS measures Task Management and Social Interaction in teams, (b) Personal Characteristics (the cause construct) of Instrumentality and Expressiveness are related to (the effect construct).Task Management and Social Interaction (the effect construct), and (c) Task Management and Social Interaction (the cause construct) are related to Team Flow (the effect construct).

The effect construct in the second assumption becomes the cause construct in the third assumption to be tested. Therefore, this study goes from testing Personal Characteristics to Teamwork factors, and from teamwork factors to team effectiveness measured by Team Flow.

Another important aspect of validity is how a cause or an effect is translated into real things. For Trochim (2000), operationalization is "the act of translating a construct into its manifestation" (Measurement Validity Types, parog.1). In this study, the concepts of teamwork and team flow have been operationalized. Teamwork for the purpose of this study is translated or operationalized by the dimensions presented in

TAS questions 1–28. A paper-and-pencil measure was developed for Task Management, Social Interaction and Trust.

Conclusion validity. In this study, is there a relationship between the variables of face-to-face teamwork represented in the factors Task Management and Social Interaction and Team Performance? The relationship was found and this study examined the next level of validity.

Internal validity. Assuming that there is a relationship in this study between the TAS factors and Team Performance is the relationship a causal one? This study examined the relation between Personal Characteristics and Teamwork and between Teamwork and Team Performance.

Construct validity. Assuming that there is a causal relationship in this study, does the TAS scale reflect well the construct of teamwork? Does the measure reflect well the idea of the construct of the measure as related to the outcome that was to be measured?

Construct validity "refers to the degree to which inferences can legitimately be made from the operationalizations in your study to the theoretical constructs on which those operationalizations were based" (Trochim, 2000, Construct Validity, parog 1). Construct validity can be examined from the translation and the criterion perspective. In other terms, did the study operationalize well the ideas of the (a) Personal Characteristics and the effect they have in teamwork behaviors, (b) Teamwork behaviors, and (c) Team Performance The goal is to be able to conclude that the measures did a credible job of operationalizing the constructs related to face-to -face teamwork and, as a result, the construct validity of the conclusions can be assessed.

Translation validity. Trochim (2000) has recommended that any time a concept or construct is translated into a functioning and operating reality (the

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operationalization), the researcher needs to be concerned about how well the translation was accomplished. Translation validity, suggested Trochim, is related to face and content validity; it refers to the general case of translating any construct into an operationalization. It assumes the researcher has a good detailed definition of the construct and checks the operationalization against it.

Criterion-related validity. In criterion-related validity, the researcher examines whether the operationalization behaves the way it should given the theory of the construct (Trochim, 2000). This is a relational approach to construct validity. It assumes that the operationalization should function in predictable ways in relation to other operationalizations based upon the theory of the construct.

Predictive validity. In predictive validity, the operationalizations ability to make accurate predictions is assessed.

Concurrent validity. In concurrent validity, the operationalizations ability to accurately distinguish between groups is assessed. In this study, the relation between Teamwork groups and Team Performance was examined.

Convergent validity. Convergent validity examines whether one instrument will be able to assign categories in the other group as determined by the other instrument. It examines if the operationalization is similar to (converges on) other operationalizations to which it theoretically should be similar.

Discriminant validity. Discriminant validity assesses if the way in which each one of the dimensions in this study diverges from other dimension it should not be similar to.

External validity. Assuming that there is a causal relationship in this study between the constructs of the cause and the effect, the question is: Can the effect of Personal Characteristics on Teamwork and of Teamwork on Team Performance be

generalized to other persons, places, or times? The population of the study has a broad university-wide -representation, which should make findings generalizable to similar university settings and learning environments.

CHAPTER 4

DATA ANALYSIS RESULTS

The purpose of this study was to examine the psychometric characteristics (validity, and reliability) of the TAS and examine its relationships with established constructs such as Personal Characteristics of Instrumentality and Expressiveness and Team Performance in Team Flow and Team Synergy.

Chapter Overview

In this chapter I present the data analysis results derived from the questionnaires. The first section of data analysis, presents the quantitative data analysis results and the second section in the following Chapter 5 presents the team observations, interviews and focus group data collected from four team cases selected to help clarify the interpretation of the constructs.

In the initial section of the chapter I present the characteristics of the sample used in the study followed by a discussion of the construct validity, internal consistency reliability and the items characteristics of the TAS. The convergent and discriminant validity of the TAS is discussed next, followed by a presentation of a Nomological Network that connects the TAS factors with 1) Personal Characteristics (PAQ) of Instrumentality and Expressiveness as antecedents and 2)Team Flow and Team Synergy as Team Performance tested by path analyses, using the combined interrelationships to address TAS Concurrent Criterion Validity. The fit of the data to the theoretical model is presented and the relationships between the TAS and team performance is examined.

Sample Description

Respondents in the total sample that answer the questionnaires were 512 undergraduate students at a large urban university in the southwest. All participants were volunteers, and no class credit was given to complete the questionnaires and participate in the study.

Data was collected in the 2003-2004 academic year, during two consecutive sessions of the same course taught by the same faculty member. A high participation rate was obtained. The first session had a larger number of students registered in the class then the second session. The class had 413 students registered in the first session and 208 students in the second. In any given day, approximately one fifth of the students were absent from the class. From the first session 362 students participated in the study and from the second session 149. The course had students working in two types of teams. 260 students (51.1%) worked in Self Selected teams, and 249 (48.9%) worked in randomly assigned teams (three students had missing this information). Only students with complete data in the scales were used in the analyses. Student demographic characteristics are presented in the Tables 1-4 below.

The gender composition of the sample was balanced with half of them were male participants (254, 49.7%) and half were females (255, 50.1%). The majority of participants were between 20 and 22 years old. Older students were 12.3 % of the sample and 3.3 were younger.

Table 1: Age of Participants

Age		Frequency	Percent	Valid Percent
Valid	19	17	3.3	3.5
	20	136	26.6	28.1
	21	169	33.1	34.9
	22	102	20.0	21.1
	23	34	6.7	7.0
	24	13	2.5	2.7
	25 or +	13	2.6	2.6
	Total	**484**	**94.7**	**100.0**
Missing	System	27	5.3	
Total		**511**	**100.0**	

The majority of the participants, 321(62.8%) describe themselves as Caucasian. Asian students were the second group in size with 79(15.5%) students and Hispanics were 55 (10.8%), 17 students (3.3%) were African American and the rest 31(6.1%) students were classified as Other.

Table 2: Ethnicity

Ethnicity		Frequency	Percent	Valid Percent
Valid	Caucasian	321	62.8	63.8
	African American	17	3.3	3.4
	Asian	79	15.5	15.7
	Hispanic	55	10.8	10.9
	Other	31	6.1	6.2
	Total	**503**	**98.4**	**100.0**
Missing	System	8	1.6	
Total		**511**	**100.0**	

From the students participating in the study 199(38.9%) were Sophomore, 189 (37%) were Junior, 83 were Senior (16.2%) and 22 (4.3%) were Freshman.

Table 3: Education

Education		Frequency	Percent	Valid Percent
Valid	Missing	18	3.5	3.5
	Freshman	22	4.3	4.3
	Sophomore	199	38.9	38.9
	Junior	189	37.0	37.0
	Senior	83	16.2	16.2
	Total	**511**	**100.0**	**100.0**

Almost half of the students, 247 (48.3%) came from the College of Liberal Arts, followed by the College of Communications with 116 students (22.7%) and the College of Natural Sciences with 85 (16.6%) of the students. The rest of participants came from other Colleges.

Table 4: College of Participants

College		Frequency	Percent	Valid Percent
Valid	Missing	2	.4	.4
	CBA	3	.6	.6
	CFA	9	1.8	1.8
	CLA	247	48.3	48.3
	CNS	85	16.6	16.6
	COE	23	4.5	4.5
	COM	116	22.7	22.7
	ENG	26	5.1	5.1
	Total	**511**	**100.0**	**100.0**

The results of the analyses will be presented next.

Data Analysis Results

There are three general categories of instrument validity: Content, Construct and Criterion validity. Content validity of the TAS was established by face-validity. The items were developed based upon a search in the literature regarding collaborative learning teams, team formation, team effectiveness, small group skills, group dynamics and development, trust building, leadership in teams and the formation of the sense of community.

In the first phase the raw TAS previously used for the peer and self assessment of online learning was refined by making the adjustments to the writing of the items with the participation of experts on the field of college assessment (Reyes, 2003) to: fine tune the language of the items to be more precise in their content, measure face-to-face teamwork and address a single idea. Also the new TAS was modified by adding items developed to examine the dimension of Trust as a building block for teamwork dynamics. Items were then assessed by experts in the Cooperative-Collaborative Learning area (Johnson-Holubec, Resta, 2003) and the author of this study.

Construct Validation is an ongoing process of examining construct related evidence of what a scale measures in a specific group of people and for specific purposes. In this validation study Construct validity was address first through exploratory factor analysis to determine the dimensions the scale measure. Second, for the next two types of Construct validity, Convergent and Discriminant, the relationships between the TAS factors and other theoretical dimensions previously established was examined. For Convergent validity it was expected the indicators to be at least moderately correlated among themselves. For Discriminant validity it was expected that the indicators of the different constructs were not highly correlated. As a moderate

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relationship was found between Expressiveness and Task Management, and an additional Post-Hoc study was called for and conducted to clarify if there was support for the use of the instrument given the moderate relationship found in Task Management. Concurrent Criterion validity was examined to study if the TAS had the power to discriminate between two extreme groups. Binary logistic regression was used as a modern way to examine the power of the TAS to achieve group membership discrimination. Finally Criterion Validity was examined with the joint effect of all the variables in a Nomological network approach to Criterion validity of the TAS.

Construct Validity of the Teamwork Assessment Scale (TAS)

RESEARCH QUESTION 1: EXPLORATORY FACTOR ANALYSES

R.Q.1. What are the factors that underlay teamwork as measured by the TAS?

Teamwork, for the purpose of this study, was measured using the TAS scale, an instrument composed of 28 items, that describe characteristics representing ingredients of successful social interaction that require positive expressiveness and empathy. Trust behaviors related to the attainment of the group's common goals that are necessary for successful achievement of task activities and task management.

Exploratory factor analysis was used to validate the instrument because the TAS was previously used for online teamwork, rather than face-to-face teamwork; also the scale items were changed to simplify their wording to assure clarity and one concept per item. In addition the scale has been expanded with new items to measure Trust.

For the initial extraction of the factors, Maximum Likelihood was the method used (Factor analysis has been discussed in page 93). Maximum likelihood (ML) produces parameter estimates that are most likely to have produced the observed

correlation matrix. Promax was used as the rotation method. Promax rotation is a method used when one wishes a Non-orthogonal solution -- that is, one in which the factors are allowed to be correlated. The degree of correlation was set by Kappa at 3 and was chosen because it provided the cleanest solution.

Initial unrestricted Exploratory Principal Components Analysis found 6 factors using the criteria of eigenvalues greater than or equal to 1.0. Subsequent exploratory analysis was run with 1, 2, 3, 4, 5 and 6 factors. The scree plot evaluation revealed that a three factor solution seemed to be a better solution and was selected because it seemed to make better theoretical sense and was in accord with the scree plot, and the items loading performance. The scree plot can be examined in the following chart (Figure 3).

Figure 3. Scree Plot of Teamwork Assessment Scale
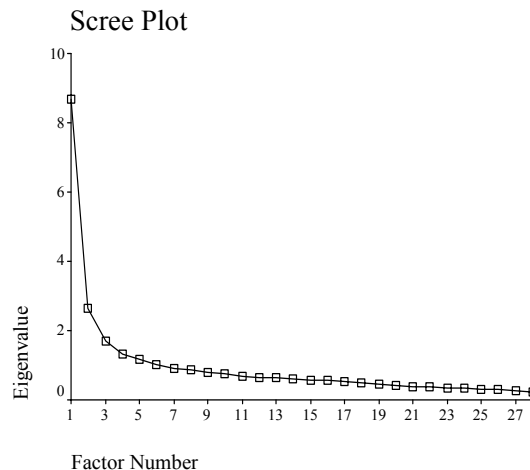
Scree Plot

In the scree plot, the change in the slope of the line, -the elbow- appears between the third and the fourth factor pointing toward a three factor solution. Next the factor loading were examined. Based on Steven's criteria of loadings above .4, fourteen items were deleted from the second exploratory analysis with the number of factors set to three. One item that came out with a lower loading than the value of 0.5 originally

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obtained in the first analysis, was deleted to construct the short version of the 13 items TAS scale examined in the following analysis.

Factor Labels

The three factor solution with 13 items was adopted as it appeared to be consistent with existing theory. Factor 1 was labeled as *Social Interaction*, Factor 2 as *Task Management* and Factor 3 as *Trust.* The initial three Factors solution revealed that, on Factor 1, there were two items that did not load higher than .40 as recommended by the Stevens (1992) criteria, and 4 items in factor 2 that also did not meet this criterion. The factor correlations in this Promax rotation with Kappa at 3 are presented in the Table 5.

Table 5: Factor Correlation Matrix

Factor	1	2	3
1	1.00		
2	.18	1.00	
3	.30	.36	1.00

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.

Item loading on each of the three factors is reported bellow in the following tables.

Factor 1 Social Interaction

Social Interaction was defined as the interpersonal behaviors that communicate respect, acceptance and willingness to work together, required for positive group interaction and operationalized by the items in the following Table 6.

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This table includes Factor 1 Social Interaction items loadings matrix for the 3 factors. All items in this short version of the scale had factor loading above .5 in factor one and low loadings in the other two factors.

Table 6: Factor 1 Social Interaction Items Factor Loadings

Item	Factor		
	1	2	3
Respect differences of opinions	**.78**	-.00	-.04
Respect differences of backgrounds.	**.70**	-.01	-.06
Willing to negotiate and make compromises.	**.69**	-.01	-.01
Sensitive to the feelings of team members.	**.55**	-.02	.26
Communicate in friendly tone.	**.54**	-.02	.01
Willing to work with others for our group success.	**.50**	.20	-.01

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.

Factor 2 Task Management

Task Management was defined as the team functioning skills and actions of leading, encouraging, sharing and helping others that result in the successful completion of team tasks. Task management items had factor loadings high in factor two and low in the other two factors. One item, Monitor Team Progress toward Tasks Deadlines, had a factor loading of .45 which is consider to meets Stevens (1992) criteria for items to keep in a scale. Given the importance of monitoring, it was consider the preservation of the item in the short scale. Factor loadings for factor two items appear in Table 7.

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Table 7: Factor 2 Task Management Items Factor Loadings

Item	Factor		
	1	2	3
Take an active role on initiating ideas or actions.	-.15	**.83**	.01
Provide leadership whenever necessary.	.02	**.67**	.01
Willing to frequently share ideas.	.07	**.64**	.06
Willing to take on task responsibilities.	.10	**.55**	-.08
Monitor team progress toward tasks deadlines.	.05	**.45**	.07

Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization.

Factor 3 Trust

The *Trust* dimension measuring interpersonal and communication skills that lead to getting to know and trust others, and interact and manage conflict.

The loadings of the two items related to sharing needs and feelings point to the principal content of the dimension where, in order for a team to perform effectively, a safe psychological space needs to exist where personal sharing can occur. Although intellectual conflict helps expose team members to multiple perspectives and to critically examine their own ideas and those of their peers, such conflict may damage the effectiveness of the team unless a base of trust and respect is first established among team members. Failure to address conflicts may reduce the levels of trust and, in turn, may negatively impact task management and the working relationships of the team.

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Table 8: Factor 3 Trust Items Factor Loadings

Item	Factor		
	1	2	3
Openly share my feelings with team members.	-.03	-.03	**.98**
Openly share my needs with team members.	.04	.09	**.67**

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.

In the TAS, scores of 1 represent low Trust Building behavior, low presence of Positive Social Interaction and Poor Task Management; scores of 5 represent higher amounts of Trust Building behavior, Positive Social Interaction and Task Management. From the scores of the individual questions in a dimension, a mean score was calculated.

Summary

Research Question 1 was addressed via exploratory factor analysis (EFA) using the SPSS program (SPSS, 2003), and the study established that the Social Interaction and Task Management factors previously found in Online Collaborative Learning teams were present in this sample of face-to-face Collaborative Learning teams. The factors were appropriate to explore the hypothesized relationships of the Social Interaction Model and the scale added a new factor named Trust. Trust is defined as a positive team environment that leads members to accomplish tasks, freely share talents, resources, ideas, and discuss points of view and shortcomings.

Social Interaction was defined as the interpersonal behaviors required for positive group interaction. Task Management was defined as the actions that result in the successful completion of team tasks. Trust was defined as a positive team

environment that leads members to accomplish tasks, freely share talents, resources, ideas, and discuss points of view and shortcomings.

A short version of the TAS scale was created using Stevens (1992) factor loadings criteria (above .4). Other more recent views on factor loadings were presented by Preacher & MacCallum (2003) that reminds us that factor loadings will vary due to sampling error and that we can not assume that loadings that are high in a single sample are correspondingly high in other samples or in the population (p.27). As it is reasonable to assume that loadings that are high in the current single sample of College students may not be correspondingly high in other samples or in the population, the following questions of the study were examined using the factor scores calculated from the long TAS version. Preacher & MacCallum recommendation to researchers trying to establish the relationships of the latent factors to the observed variables, for a scale in development states that 1) no absolute cutoff point should be defined and 2) to be interested in the complete pattern of loadings (including low loadings and mid-range loadings). Consistent with their recommendation, the full 28 item version of the TAS was used in this exploratory study to examine research questions two, three and four presented next. Full information of the factor structure of the long version is presented in Appendix G.

RESEARCH QUESTION 2: RELIABILITY

Does the TAS have Internal Consistency Reliability to measure teamwork?

Reliability

Reliability analysis allows you to study the properties of measurement scales and the items that make them up. Measurement reliability is rooted in the degree to which measurement of any phenomenon is confounded by factors that are designated

either random error or systematic error/bias. The major concern of reliability is controlling for error. Carmine and Zeller (1985) explains that "a highly reliable indicator of a theoretical concept is one that leads to consistent results on repeated measurements because it does not fluctuate greatly due to random error" (p. 13). Reliability, therefore, is related to measurement. Using reliability analysis, you can determine the extent to which the items in your questionnaire are related to each other, you can get an overall index of the repeatability or internal consistency of the scale as a whole, and you can identify problem items that should be excluded from the scale.

There are four types of methods of estimating reliability: Test – Retest Method (Retest Method), Alternative Forms Method (Equivalent Forms Method), Split-Halves Method and Internal Consistency Method. In this section the Internal Consistency Reliability (Cronbach's Alpha) for the TAS overall and for each of the factors in the final factor solution will be reported. Cronbach's Alpha is a model of internal consistency, based on the average inter-item correlation.

Consistency of the test items

SPSS (2003) Reliability procedure was used as a means of calculating consistency coefficients and correlation coefficients. SPSS provides a measurement of internal consistency (reliability) of the test items.

Cronbach's Alpha Internal Consistency Reliability

Internal consistency reliability coefficients and correlations among the subscale scores and between the subscale scores were calculated, and an item analysis was conducted in 500 complete questionnaires. Alpha can vary from 0 to 1, with 1 indicating that the test is perfectly reliable, the higher the correlation, among the items,

the higher the alpha. High correlations imply that high (or low) scores on one question are associated with high (or low) scores on other questions. Furthermore, the computation of Cronbach's Alpha when a particular item is removed from consideration is a good measure of that item's contribution to the entire test's assessment performance. Cronbach alpha reliability coefficients demonstrated high levels of internal consistency. Cronbach Alpha Coefficients higher than 0.8 are considered high reliability and 0.7 is adequate reliability

Assumptions

In order to calculate the reliability coefficients the observations used were independent, and it was assumed that errors were uncorrelated between items. Other assumptions of reliability analysis are that each pair of items should have a bivariate normal distribution. Also scales should be additive, so that each item is linearly related to the total score.

Internal consistency reliability (Cronbach's Alpha coefficient) was computed jointly for both course sections to assess whether the items were answered in a similar manner.

Social Interaction Factor

For the Social Interaction Factor, Cronbach Alpha Coefficient based on 11 items, was 0.87. Changes in Cronbach Alpha Coefficients with items deleted can be examined in the right column of the Table 9 together with the item content. The table also presents the Means, Standard Deviations and the Corrected Item-Total Correlation

Table 9: Cronbach Alpha Coefficient for Social Interaction Factor

Item No.	Social Interaction Items Content	Means	Std. Dev	Item Total Correl.	Alpha if Item Deleted
7	Respect differences of opinions	4.25	.84	.59	.86
9	Willing to negotiate and make compromises	4.21	.78	.59	.86
8	Respect differences of backgrounds	4.50	.76	.53	.86
15	Communicate in friendly tone.	4.23	.78	.52	.86
20	Sensitive to the feelings of team members	4.02	.89	.71	.85
14	Willing to work with others for our team success	4.52	.66	.54	.86
28	Flexible to adapt to team needs.	3.98	.79	.47	.87
19	Sensitive to the needs of team members	3.88	.84	.64	.85
21	Understand problems of team members	3.82	.82	.61	.86
12	Acknowledge other members' good work	4.33	.74	.53	.86
13	Provide positive feedback.	4.04	79	.53	.86

The item total correlation between the respective item and the total sum score (without the respective item), shows the items that seem to relate well with overall test performance. In this scale, two items stand out: *Sensitive to the feelings of team members* and *Sensitive to the needs of team members* have the highest correlation with the scale total. Also Flexible to adapt to team needs, had the lowest item total correlation.

The "Alpha if Item deleted" provides a measure of the change in the Alpha statistic if the question is deleted from the scale. In this case, if the item is dropped from the scale alpha reliability will remain the same, nothing will be gained, so it would be better to keep it in the scale. Both *Sensitive to the Feelings of Team Members* and *Sensitive to the Needs of Team Members* produced the largest reduction in the reliability coefficient of this factor.

For the short version of the TAS scale, the Reliability Coefficient calculated for the Social Interaction Factor using 6 items was .81, a significant reduction from Alpha coefficient .87. A reduction of some sort happens in the Reliability when a scale is shortened.

Task Management Factor

For the Task Management Factor, based on 12 items, yielded a Cronbach Alpha Coefficient of 0.85. The items *Willing to Frequently Share Ideas*, and *Provide Leadership Whenever Necessary* had the highest point biserial correlation and produced the largest reduction in Alpha coefficient if the items are deleted, although the reduction is only 2 decimal points. These two items have also the highest correlation with the total score.

Table 10: Cronbach Alpha Coefficient for Task Management Factor

Item No.	Task Management Items Content	Means	Std. Dev.	Item Total Correl.	Alpha if item Deleted
2	Willing to take on task responsibilities	4.17	.76	.52	.83
1	Take an active role on initiating ideas	3.79	.87	.54	.83
10	Provide leadership whenever necessary	4.13	.86	.59	.83
3	Willing to frequently share ideas.	4.02	.87	.60	.83
5	Accept responsibilities for tasks deadlines	4.30	.72	.50	.84
27	Monitor team progress toward tasks deadlines	3.51	.99	.51	.83
17	Produce high quality work.	4.02	.74	.45	.84
4	Willing to frequently share resource	3.98	.85	.50	.83
16	Keep contact so everyone knows how things are	3.49	.96	.53	.83
11	Provide support whenever necessary.	4.22	.76	.52	.83
18	Meet team's deadlines.	4.17	.82	.38	.84
6	Help promote my team's sense of community	3.69	.95	.51	.83

The correlation between the respective item and the total sum score (without the respective item), shows the items that seem to relate well with overall test performance. and the internal consistency of the scale (coefficient *alpha*) if the respective item would be deleted. In this scale, one items stand out: *Meet team deadlines* have the lowest correlation with the scale total. In this case, if the item is dropped from the scale alpha reliability will remain almost the same, not much will be gained, so it would be better to keep it in the scale.

For the short version of the TAS scale in the Task Management Factor Reliability Coefficients calculated using 5 items was .77, a considerable reduction from Alpha coefficient .85 obtained with all the items.

Trust Factor

For the Trust Factor, the Cronbach's Alpha for 5 items was .80. The item *Openly Share my Feelings with Team* had the highest item-total correlation and produced the largest reduction in the Alpha coefficient if the item is deleted. Also a similar dimension *Openly Share my Needs with Team Members* had a similar behavior as can be examined in Table 11.

Table 11: Cronbach Alpha Coefficient for Trust Factor

Item No.	Trust Items Content	Means	Std. Dev	Item Total Correl.	Alpha if item Deleted
24	Openly share my feelings with team	3.14	1.10	.65	.74
23	Openly share my needs with team members	3.33	1.06	.62	.75
22	Contribute possible solutions to problems	3.84	.83	.51	.78
26	Establish positive dialog to resolve team conflicts	3.78	.85	.57	.77
25	Promote a positive team environment	3.96	.79	.58	.76

The item *Contribute possible solutions to problems* had the lowest item total correlation and the smallest drop in the Alpha Coefficient if the item is deleted, even though the difference was small.

For the short version of the TAS scale in the Trust Factor Reliability Coefficients calculated using two items was .81, a one decimal point increase from Alpha coefficient .80 obtained with five items. The Cronbach's Alpha coefficients obtained are considered an indication of high scale consistency. Cronbach Alpha Coefficient higher then .8 is consider high reliability and .7 is adequate reliability.

Summary

In summary, Cronbach Alpha Reliability Coefficients obtained for the three subscales are considered an indication of high scale consistency. They were 0.80 (Trust), 0.85 (Task Management) and 0.87 (Social Interaction). The Cronbach's Alpha coefficients Cronbach Alpha Coefficient higher then .8 is consider high reliability and .7 is adequate reliability. Changes in Cronbach Alpha Coefficient with deleted items reveled that the scales are likely to have its reliability reduced if any of the current items are deleted. The coefficients obtained are deemed acceptable and generally support the use of the TAS scale and its scores for the assessment of face-to-face teamwork. We will review next the discrimination of the items.

From this perspective, all TAS items met the two criteria discussed:

1) Respondents who tended to score high on the scale overall tended to answer items with a high score and in addition to this response pattern, it was found that

2) A decrease in Alpha if the item is removed from the scale.

Further refinement and careful examination on a different sample is recommended for items that load in more then one dimension and which explore important aspects of a factor. Given that factor loadings in more then one factor are problematic, items may be dropped in future versions if they continue to load highly in more then one factor. The Item total correlation in the Task Management factor suggest that the TAS scale may gain by adding new items to assess more shared leadership issues of teamwork. Also the Social Interaction Factor brings up the importance of empathy in team interaction, and the reciprocity between the sensitivity and receptiveness that facilitate trust building processes required for team member to be able to *Openly Share Feelings with a Team,* as indicated by the correlation of the trust and social interaction factors. We will review next the discrimination of the items.

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Relatively low to moderate correlations were found among the subscales. These included .41 for Social Interaction, .38 for Task Management, and .51 for Trust. These correlations may be contrasted with the relatively moderate to high correlations found between each of the subscales and the total scale. Correlations of each of the subscales with the total scale are as follows: .71 for Social Interaction, .60 for Task Management and .65 for Trust. These findings suggest that different yet related aspects of teamwork are assessed with the use of the scale.

The correlations, means, and standard deviations of the subscales for the combined Samples 1 and 2 appear in third and fourth columns of the table. The correlations among the subscales for the two course sections combined sample ranged from .53 to .58 all significant with a p>.0001.

Table 12. Factor Scales Pearson Correlations and Descriptive Statistics

Factors, Means, Standard Deviations	Social Interaction	Task Management	Trust
Social Interaction	1.00		
Task Management	.53(**)	1.00	
Trust	.54 (**)	.58(**)	1.00
Mean	4.16	3.96	3.60
Std. Deviation	.51	.51	.70

N=497 **Correlation is significant at the 0.01 level (2-tailed).

ITEM INTERCORRELATIONS

Respondents who tended to score high on the scale overall tended to answer items with a high score. This is the desired outcome taken into consideration jointly with the decrease in Alpha if the item is removed from the scale. From this perspective,

all TAS items met the two criteria identified above. Further refinement and careful examination on a different sample is recommended for items that load in more then one dimension and which explore important aspects of the factor. Given that factor loadings in more then one factor are problematic, items may be dropped in future versions if they continue to load highly in both factors. The Item total correlation in the Task Management factor suggest that the TAS scale may gain by adding new items to assess more shared leadership issues of teamwork. Also the Social Interaction Factor brings up the importance of empathy in team interaction, and the reciprocity between the sensitivity and receptiveness that facilitate the trust building process required for a team member to be able to *Openly Share Feelings with a Team*, as indicated by the correlation of the trust and social interaction factor items.

Reliability coefficients are direct estimates of proportions of consistent score variation. The reliability and validity evidence from this study provides information about the usefulness of the TAS for the assessment of face-to-face teamwork. The TAS has high internal consistency reliability, and moderate high correlations among the subscale scores.

Construct Validity II

Construct Validity was addressed as factorial validity in research question 1. In this question additional evidence for construct validity is examined by *Convergent* and *Discriminant Validity*.

Convergent and Discriminant Validity: Personal Characteristics and Teamwork

RESEARCH QUESTION 3

R.Q. 3. What is the relationship between the TAS and the PAQ?

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Convergent validity examines whether the operationalization is similar to (converges on) other operationalizations to which it theoretically should be similar. An instrument is convergent when it significantly correlates with other. There are no firm rules as to how high or low the correlations should be to provide evidence for convergent validity or for discriminant validity but it is expected that convergent correlations will always be higher than the discriminant ones. *Discriminant validity* assesses the way in which each one of the dimensions in this study diverges from other.

After determining that the data sets had absolute values of univariate skewness and kurtosis indexes that can be described as normal (see Appendix F) it was determined that the data was suitable for analyses, a matrix of Pearson correlations of the variables of interest was generated; correlations are presented in Table 13.

Table 13:TAS by PAQ Pearson Correlations

Scale	Social Interaction	Task Management	Trust	Instrumen-tality	Expressi-veness
Social Interaction	1				
Task Management	.53(**)	1			
Trust	.54(**)	.58(**)	1		
Instrumentality	.08	.47(**)	.26(**)	1	
Expressiveness	.63(**)	.41(**)	.41(**)	.04	1

** Correlation is significant at the 0.0001 level (2-tailed).
N=497

For TAS Convergent Validity with the PAQ, all correlations were positive and were found to be moderate to moderately high. A Pearson bi-variate correlation (2-tailed) analysis on the aggregate scores of the test items of the TAS indicated that correlations were in the convergent direction expected for Expressiveness and Social

Interaction, Expressiveness and Trust, Instrumentality and Task Management, Instrumentality and Trust.

In order to support the Divergent Validity of the TAS, it was expected that the correlation between (a) Expressiveness and Social Interaction (r = 0.63, significant p< 0.0001, 2-tailed) would be higher then the correlation between (b) Instrumentality and Social Interaction and it was found that the (a) correlation between Instrumentality and Social Interaction of r = 0.08 was non significant (p< 0.09, 2-tailed). Thus for Social Interaction, evidence of convergent and discriminant validity was established through the correlations with the expected theoretical patterns with the PAQ,

In the next analysis on the Task Management Factor, it was expected that the correlation between (a) Instrumentality and Task Management would be higher then the correlation between (b) Expressiveness and Task Management. It was found that the (a) correlation between Instrumentality and Task Management r. = 0. 47, was significant at p < 0.0001, 2-tailed. The correlation between (b) Expressiveness and Task Management, r. = 0. 41, was significant at p < 0.0001, 2-tailed. The Instrumentality and Task Management correlation provides support for the expected Convergent validity relationship. However the correlation between Expressiveness and Task Management is also considered moderate as the correlation between Instrumentality and Task Management was. The pattern of correlations follows the criteria of being smaller then the convergent relationship but identifies the need to find additional evidence of the discrimination power of the Task Management Factor through different a theoretical relationship or type of analysis as the evidence falls in a grey area as to the divergent relationship with Expressiveness.

The correlation between Task Management and Expressiveness supports the relationship between Expressive skills for Task Management and indicates that there is

something that is shared in common between Task Management and Expressiveness. In order to clarify the Task Management construct additional Post-Hoc binary logistic regression analyses were conducted to study if the TAS could discriminate and predict extreme group membership. These analyses complement the validity evidence and will be presented after the discussion of Trust convergent and discriminant evidence.

Although it was also a significant correlation, the size of the coefficient is much smaller supporting the TAS Social Interaction Factor Convergent and Discriminant validity.

Finally, it was expected that (a) TAS Trust correlated higher with Expressiveness then with Instrumentality. TAS Trust and Expressiveness was r. = 0.41, significant p < .0001, (2-tailed). TAS Trust and Instrumentality correlation was r. = 0.26, significant p < .0001 (2-tailed). The difference in the size of the correlation coefficient points toward a closer relationship between Trust and Expressiveness, however, a smaller but statistically significant relationship with Instrumentality was found. The difference in the correlation coefficients can be understood as evidence of Convergent and Discriminant validity for the Trust factor.

Summary

The examination of convergent validity of the study was accomplished through an analysis of (a) PAQ Instrumentality and TAS Task Management, and (b) PAQ Expressiveness and TAS Social Interaction and (c) PAQ Expressiveness TAS Trust. The correlations found were in support of all convergent hypothesized relationships.

For Discriminant validity correlation coefficients were examined between (a) PAQ Instrumentality and TAS Social Interaction, and (b) PAQ Expressiveness and TAS Task Management (c) PAQ Instrumentality and TAS Trust.

Discriminant validity for Task Management and Expressiveness was not clearly supported as the relationship between the two scores is similarly moderate and as statistically significant as the relationships that support convergent validity for Task Management and Instrumentality. The significant correlation indicates that the two factors scales, the TAS Task Management and PAQ Expressiveness, shared common variance and are not measuring divergent aspects of personal characteristics and aspects of teamwork. It is possible that for high Task Management a high level of Expressiveness is required. To further clarify the Discriminant validity of the TAS, an extreme groups Post-Hoc Analysis was conducted by means of Binomial Logistic Regression. The results of the Analysis are presented next as the need arisen to use multiple methods to assess instrument quality.

Extreme Groups Analyses

The "extreme groups" approach searches for validity evidence of the TAS factors by using data for only those individuals that scored Team Flow as either very high or very low. Likewise for Team Synergy the extreme groups approach examines the relationships between the TAS scores and Team Synergy scores. The questionnaire data was collected simultaneously with the TAS.

The binary logistic regression analyses were used to find out whether the TAS factors contributed to the prediction of 1) Team Flow and 2) Team Synergy.

From 497 cases that had complete data in all the questionnaires, 30% of the cases (149) were included in the analysis. 15% percent were the low Z scores and formed the first group coded as 0 for the analysis and fifteen percent had the scores above 1 Z and went to form the second group coded as 1 for the analysis (knowing which group of the dichotomous dependent variable was 0 and 1 is important to

interpret the values of the parameter coefficients). 70% of the cases (348) were coded as missing and were not included in the binary logistic regression.

Team Flow Extreme Groups Analysis

The first study examined extreme groups based on Team Flow Z scores. Group one was composed of participants that scored below I Z score and a Z score under 1 represent those individuals that scored one standard deviation under the mean value. Group 2 was composed of participants that scored above 1 Z score. A Z score over 1 represent those individuals that scored one standard deviation above the mean value. *Team Flow,* for the purpose of this study, was defined as a process of optimal experience that occurs when teams participate in a highly challenging project where the team project requires the use of members' skills, and team members are: a) mutually engaged in collaboration; b) intensely involved in their team activities; c) experiencing shared knowledge building; and d) stretching their capabilities with the likelihood of learning new skills, especially learning to work in teams. Participants in group 1 represented those who were not engaged or enjoying working together. Participants in group 2 fit the description of Team Flow and manifested that they were engaged and enjoying their team process.

With no predictors entered in the equation model, it predicts that all cases belong to the modal category score. The overall percentage of accurate prediction was 53% with no predictor variables.

When predictors were added in the model using the method of entering the three TAS factor scale scores at once, the examination of the omnibus tests, (which are measures of how well the model performed when the variables were entered) indicated that the model was significant, Chi-square = 50.21, df=3, $p < 0.001$,

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In linear regression, the R-square statistic measures the proportion of the variation in the response that is explained by the model. Larger pseudo R-square statistics indicate that more of the variation is explained by the model, to a maximum of 1. The R-square statistic cannot be exactly computed for logistic regression models, so approximations are computed instead. In this study, Nagelkerke R-squared was .38.

The chi-square statistic in Hosmer and Lemeshow Test, is the change in the -2 log-likelihood from the previous step 0, and the significance () of the change is large (i.e., greater than 0.10).

At each step, the Hosmer and Lemeshow goodness-of-fit test of the null hypothesis that the model adequately fits the data. If the null is true, the statistic should have an approximately chi-square distribution with the displayed degrees of freedom. If the significance of the test is small (i.e., less than 0.05) then the model does not adequately fit the data. In the study TAS factors and of Team Flow extreme groups, the model tested adequately fit the data ($\chi^2 = 3.79$, df =6, p=.88).

The classification Table 14 presented next helps assess the performance of the model (three TAS factors entered to predict Team Flow), by cross tabulating the observed response categories with the predicted response categories. For each case, the predicted response is the category treated as 1, if that category's predicted probability is greater than the user-specified cutoff.

Cells on the diagonal are correct predictions. When the TAS factors are entered into the analysis, the percentage of cases correctly classified as falling bellow 1Z in Team Flow decreased from step 0 where 100 % were classified by the constant to 73.4% and the percentage of cases correctly classified as falling above 1Z in Team Flow increased from 0% to 75.7 % from step 0. The Cells off the diagonal are incorrect predictions. Overall percent correctly classified increased from 53% to 74.5%.

Table 14: Team Flow Classification Table(a)

Observed			Predicted		
			Team Flow		Percentage Correct
			1 Below 1 Z	2 Above 1 Z	
Step 1	Team Flow	1.00 Below 1 Z	58	21	73.4
		2.00 Above 1 Z	17	53	75.7
	Overall Percentage				74.5

a The cut value is .50

The following table summarizes the roles of the parameters in the model. Where B, is the estimated coefficient, with standard error S.E. The ratio of B to S.E., squared, equals the Wald statistic. The Wald statistic was significant (i.e., less than 0.05) for Task Management and marginally significant for Social Interaction. In the case of Task Management indicated that the parameter is useful to the model to discriminate between extreme groups that score 1 Z below or above in Team Flow. This evidence provides additional validity evidence for the Task Management Factor that needed to be explored more due to the moderate correlations found in the previous analysis between Task Management and Expressiveness.

The Exp(B) is the predicted change in odds for a unit increase in the predictor. When Exp(B) is greater than 1, increasing values of the variable correspond to increasing odds of the event's occurrence. The Task Management Exp(B)was 6.253 and 2.474 for Social Interaction and 1.053 for Task. That is higher scores in Social Interaction and Task Management scores increase the probability of belonging to the high Team Flow group.

Table 15: Variables in the Team Flow Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	Social Interaction	.91	.49	3.40	1	.065	2.47
	Task Management	1.83	.51	12.73	1	.000	6.25
	Trust	.05	.36	.02	1	.884	1.05
	Constant	-11.55	2.06	31.23	1	.000	.000

a Variable(s) entered on step 1: Social Interaction, Task Management, Trust.

In summary the multivariate analysis of extreme groups produced evidence regarding the validity of the three TAS dimensions to predict Team Flow in extreme groups. By examining the multivariate relationships between TAS scores and Team Flow, additional evidence of TAS validity was provided for this sample of college students.

Team Synergy Extreme Groups Analysis

The second study examined extreme groups based on Team Synergy Z scores. Group one was composed of participants that scored below I Z score and group 2 was composed of participants that scored above 1 Z score. *Team Synergy,* for the purpose of this study, was defined as the state of high performance evidenced by high levels of creativity and productivity. Participants assigned to group 1 did not describe themselves as creative or productive. Participants in group 2 fit the description of Team Synergy and described themselves as productive in working together and their interactions in their team process made them creative.

From the 497 participants that answer both TAS and TS, 154, 31%, were selected as members of the group 1 or group 2.

With no predictors entered in the equation model, it predicts that all cases belong to the modal category score. The overall percentage of accurate prediction was 55.2% with no predictor variables.

When predictors were added in the model using the method of entering the three TAS factor scale scores at once, the examination of the omnibus tests, (which are measures of how well the model performed when the variables were entered) indicated that the model was significant, Chi-square = 61.74, df=3, p < 0.001,

In linear regression, the R-square statistic measures the proportion of the variation in the response that is explained by the model. Larger pseudo R-square statistics indicate that more of the variation is explained by the model, to a maximum of 1. The R-square statistic cannot be exactly computed for logistic regression models, so approximations are computed instead. Nagelkerke R-squared was.44 in this analysis.

The chi-square statistic in the Hosmer and Lemeshow Test (SPSS, 2003), is the change in the -2 log-likelihood from the previous step 0, and the significance (p= .88) of the change is large (i.e., greater than 0.10).

At each step, the Hosmer and Lemeshow goodness-of-fit test of the null hypothesis that the model adequately fits the data. If the null is true, the statistic should have an approximately chi-square distribution with the displayed degrees of freedom. If the significance of the test is small (i.e., less than 0.05) then the model does not adequately fit the data. In the study TAS factors and of Team Synergy extreme groups, the model tested adequately fit the data (χ^2 = 3.37, df =6, p=.91).

The classification Table 16 presented next helps assess the performance of the model (three TAS factors entered to predict Team Synergy), by cross tabulating the observed response categories with the predicted response categories. For each case, the

predicted response is the category treated as 1, if that category's predicted probability is greater than the user-specified cutoff.

Cells on the diagonal are correct predictions. When the TAS factors are entered into the analysis, the percentage of cases correctly classified as falling bellow 1Z in Team Synergy increased from step 0 where 0 % were classified by the constant to 66.7% and the percentage of cases correctly classified as falling above 1Z in Team Synergy also decreased from 100% to 77.3 % from step 0. The cells off the diagonal are incorrect predictions. The Cells off the diagonal are incorrect predictions. Overall percent correctly classified increased from 55.2% to 77.3%.

Table 16: Team Synergy Classification Table(a)

Observed			Predicted		
			Team Synergy		Percentage Correct
			1 Below 1Z	2 Above 1Z	
Step 1	Team Synergy	1 Below 1Z	**46**	23	66.7
		2 Above 1Z	12	**73**	85.9
	Overall Percentage				**77.3**

a The cut value is .500

The following table, Variables in the Equation summarizes the roles of the parameters in the model. Where B is the estimated coefficient, with standard error S.E. The ratio of B to S.E., squared, equals the Wald statistic. The Wald statistic was significant (i.e., less than 0.05) for Task Management p.>.01, marginally significant for Social Interaction, p.>.06 and Significant for Trust p.>.03. In the case of Task Management and Trust indicated that the parameters are useful to the model to discriminate between extreme groups that score 1 Z below or above in Team Synergy. Also Social Interaction contributes to the prediction.

Table 17: Variables in the Team Synergy Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	Social Interaction	.90	.49	3.37	1	.066	2.46
	Task Management	1.37	.50	7.48	1	.006	3.95
	Trust	.76	.35	4.85	1	.028	2.14
	Constant	-11.92	2.17	30.12	1	.000	.000

a Variable(s) entered on step 1: Social Interaction, Task Management, Trust.

In summary the multivariate analysis of extreme groups produced evidence regarding the validity of the three TAS dimensions to predict Team Synergy in extreme groups. By examining the multivariate relationships between TAS scores and Team Synergy, additional evidence of TAS validity was provided for this sample of college students.

Criterion Validity: Personal Characteristics, Teamwork and Team Performance

RESEARCH QUESTION 4: NOMOLOGICAL NETWORK

R.Q. 4. To what extent does the Social Interactions Teamwork Model fits the data?

The primary purpose of question 4 was to examine if Team Performance reflected in Team Flow and Team Synergy can be predicted from the Teamwork Factors of Trust, Social Interaction and Task Management and Personal Characteristics of Instrumentality and Expressiveness.

Although other models may have superior fit I was interested in testing a model derived from Vygotsky's social constructivist paradigm, which states that the higher psychological functions are of sociocultural origin and presents social interaction as a condition *sine qua non* for social learning. In this Model, I propose that two personal

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characteristics related to Teamwork Factors are Instrumentality and Expressiveness which are based on earlier constructs of Agency and Communion (Wiggings, 1991).

The Social Interaction Model was examined using a path model developed to test the value of the TAS as an instrument to examine teamwork processes. The model tested hypotheses for the relationships between personal characteristics as antecedents of teamwork behaviors. These included:

Expressiveness predicts Social Interaction.

Instrumentality predicts Task Management.

Expressiveness and Instrumentality predict Trust.

Trust, had a direct effect on Social Interaction and Task.

Social Interaction predicts Task Management Team Flow and Team Synergy.

Trust predicts Social Interaction, Task Management, Team Flow and Team Synergy.

All paths to the variables were hypothesized to be positive as indicated in Figure 1 (Pag.10).

Path analysis was used in this study to test the plausibility of the proposed theoretical model among the sample of college students. Path models include *exogenous* variables, whose variability was not explained in the model, and *endogenous* variables, whose variability is attributed to other variables in the model. The main goal of a path analysis is to account for the covariances of observed exogenous and endogenous variables with a structural model of their presumed unanalyzed associations, spurious associations, and causal relations with each other. Independent or exogenous variables receive no causal input.

In this study, Personal Characteristics were considered exogenous or independent variables whose variability is not explained in the model. Positive Social

Interaction, Trust, Task Management and Flow are endogenous variables whose variability is attributed to variables in the model.

Responses were obtained at the individual level and a model was tested as an initial step in understanding team processes and performance and the effect personal characteristics have on teamwork. The model examined the paths to see whether their path coefficients were significant.

The Chi-square statistic was used to test for differences between the tested model and an alternative model that perfectly fits the data. Thus a non-significant Chi-square value indicates that there is no significant difference between the fit of the tested model and a perfect model; that is if the Chi-square is non-significant, the tested model provides good fit to the data. The results found in testing the model are described next.

Variables

The path analyses examined the joint relationships between the Independent or *Exogenous* Personal Characteristics that included gender role orientation-specifically, Instrumentality and Expressiveness. The teamwork processes variables included Social Interaction, Trust and Task Management and the team performance was examined by Team Flow and Team Synergy.

Overall Goodness of Fit

A number of estimates of the fit of a path model were available and indicated good fit of the data to the theoretical model. Goodness of fit refers to how well the tested model fits the sample data. Standard MPlus 3.2 output provides several estimates of the goodness of fit: The Chi-square statistic; the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Residual (RMSR); and the (SMRS).

The Chi-square ratio is an additional, easily calculated estimate of goodness of fit recommended by Byrne (1989). The CFI of the model was .99, where >.950 is generally considered to be a reasonable cut-off for model fit. The TLI was at 0.98. Another fit indicator that has gained acceptance for structural equation models, the RMSEA, was at 0.04, which meets the cut off value of <.06.

The model results indicated an adequate fit of the model with a non significant $\chi2$ ($\chi2$= 9.9, df = 6, p=0.13).

The path coefficients generated in the test of the Social Interaction Model, are presented in Figure 4 with the hypothesized causal ordering of the relationships predicting Teamwork dimensions and Team Flow and Synergy.

Table 18: Summary of Model-Fit Statistics

Test of Model Fit	χ^2	Df	p-value	CFI	RMSEA
Social Interaction Model Individual Level of Analysis	9.9	6	*n.s.*	.99	.04

The path coefficients generated in the test of the Social Interaction Model are presented in Figure 4.

Figure 4. Social Interaction Model Path Coefficients
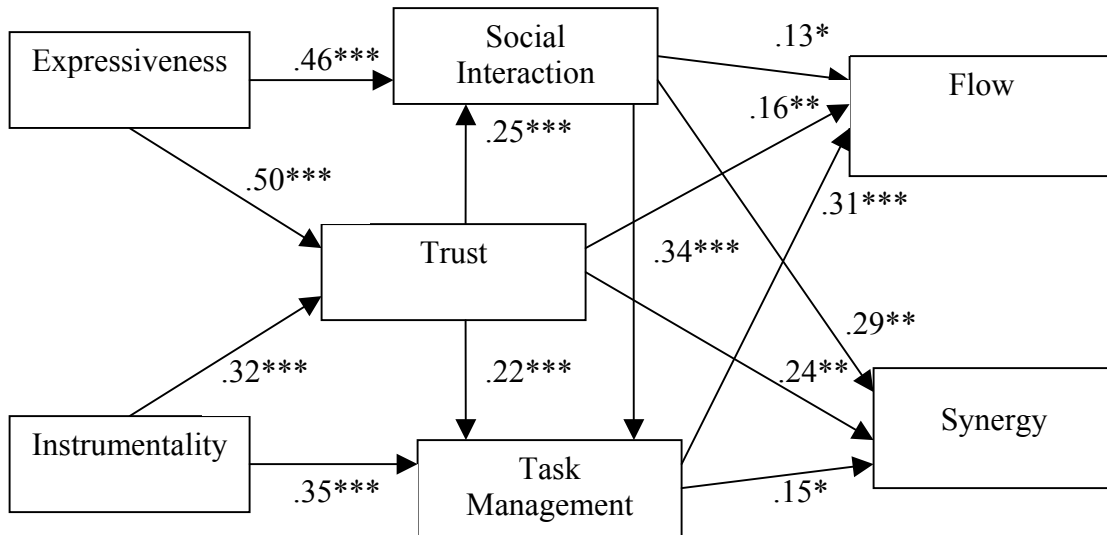
* = p<.10 ** = p<.01 *** = p<.001

The figure presents standardized betas only following King's (1989) recommendation that standardized betas are a more useful estimate of path coefficients because they represent the degree of change in a dependent variable given a single unit of change in the explanatory variable. Therefore standardized path loadings are reported for the path model presented above in Figure 4, along with their measures of statistical significance.

Decomposition of the direct and indirect effects in the model of teamwork is presented next in Tables 19 and 20. The direct effects represent a standardized estimate of the effect of the predictor variables on the dependent variables and may be used as path coefficients; however, because they are unstandardized, they are more difficult to interpret.

Table 19: Direct Path Coefficients in the Final Social Interaction Model

	Standardized Beta Coefficients	Standard Error	Critical Ratio	Sig.
Dependent: Social				
Expressiveness	0.46	0.04	12.85	p<.0001
Trust	0.25	0.03	9.17	p<.0001
Dependent: Trust				
Expressiveness	0.50	0.05	10.37	p<.0001
Instrumentality	0.32	0.05	5.82	p<.0001
Dependent: Task				
Instrumentality	0.35	0.03	11.20	p<.0001
Social Interaction	0.34	0.03	8.74	p<.0001
Trust	0.22	0.32	6.91	p<.0001
Dependant Engagement				
Task	0.22	0.04	6.91	p<.0001
Trust	0.31	0.08	3.81	p<.0001
Social Interaction	0.13	0.07	1.73	p<.05
Dependent Synergy				
Task	0.15	0.10	1.41	p<.05
Trust	0.24	0.10	2.43	p<.0001
Social Interaction	0.29	0.10	2.88	p<.0001

The indirect effects are also unstandardized and represent the effects of the predictor variables mediated by other variables in the model. All Direct and indirect effects were significant.

Table 20: Indirect Paths Coefficients in the Final Social Interaction Model

	Standardized Beta Coeffi-cients	Standard Error	Critical Ratio	Sig.
Dependent: Social Interaction				
Trust and Instrumentality	0.08	0.02	5.30	p<.0001
Dependent: Task				
Social and Expressiveness	0.16	0.02	6.92	p<.0001
Trust and Instrumentality	0.08	0.02	5.30	p<.0001
Trust and Expressiveness	0.11	0.22	5.08	p<.0001
Sum of indirect Effects from Instrumentality to Social Interaction	0.080	0.015	5.47	p<.0001
Sum of indirect Effects from Instrumentality to Task	0.07	0.02	4.52	p<.0001
Sum of indirect Effects from Expressiveness to Task	0.27	0.02	11.73	p<.0001

Variance Explained by the Model

The Squared multiple correlations (R2's) represent the amount of variance explained by the model by each endogenous variable.

A significant amount of the variance in teamwork was explained by the variables in the model. The amount of variance accounted for Social Interaction, was 0.49 and for Task management 0.52 which are consider to represent a large effect. The amount of variance accounted for Trust was 0.22 representing a medium size effect of the variable   Team Flow's R-Square was 1.57 and Team Synergy was .11 indicating that the amount of variance explained by these two variables is small, low amounts indicate that some important relationships are missing in the model to explain the relationship with team performance.

As it is an exploratory analysis, the model needs to be further tested with new samples before drawing more definitive conclusions (for an alternative way to analyze the data see Appendix H).

Results indicated that the Social Interaction model was plausible in the sample of college students. Findings from the analysis provided evidence supporting the primacy of a safe and trusting positive social environment and its influences over the accomplishment of tasks and in predicting the engaged enjoyment in activities that challenge students to develop their skills and potential while working in learning teams.

Summary of Path Model predicting Teamwork Performance

Question four of this study examined the fit of the model in Figure 1 to data from a sample of college students. Results of the path analyses indicated that the model of Social Interaction representing the relationships between Personal Characteristics, Teamwork and Team Performance was supported as the proposed Model was plausible in the in the college students sample and the data collected in this study fit the model.

It was hypothesized that the model in Figure 1 (Pag. 10) would provide a good fit to the data. The overall indices of fit support the plausibility of the model in the sample data. Arrows in the path model represented a hypothesized causal relationship in the direction of the arrow. All relationships specified in Figure 1 that were hypothesized to be positive, and the four theoretically based indirect effects were hypothesized to be significant were found.

Based on the joint criteria of fit, the Social Interaction Path Model predicting Teamwork performance met the cutoff of fit indices and the model appeared to fit very

well as judged by the fit indices. As it is an exploratory analysis, the model needs to be further tested with new samples before drawing more definitive conclusions.

QUANTITATIVE DATA ANALYSIS SUMMARY

This study evaluated the psychometric properties through examination of (a) the factor structure through EFA, (b) internal consistency reliability, and item analyses and intercorrelations among the subscales (c) the factor correlations with other constructs by means of correlations and (d) path analysis models.

The evidence found in the Factor Analysis, the Reliability Cronbach Alpha values and the correlations and the path model goodness of fit indices, indicated that the data fit very well the Social Interaction Model and generally support the use of the TAS scale and its scores for the assessment of the Social Interaction, Task Management and Trust dimensions of Teamwork.

The examination of convergent validity of the study was an analysis of (a) PAQ Instrumentality and TAS Task Management, and (b) PAQ Expressiveness and TAS Social Interaction and (c) PAQ Expressiveness TAS Trust. The correlations found were in support of all convergent hypothesized relationships.

For Criterion Validity a process of extreme groups' discrimination was conducted by means of binary logistic regression, which is a means to determine the power of a variable to discriminate group membership.

Discriminant validity for Task Management Trust and Social Interaction was supported as the factors of the TAS were able to predict group membership in Team Flow and Team Synergy. The discrimination power of Task Management to predict extreme group membership in Team Flow, is as highly significant as the relationships that support convergent validity for Task Management and Instrumentality. In addition

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a significant correlation between the TAS Task Management and PAQ Expressiveness indicates that Task Management and Expressiveness had a good amount in common and are not measuring divergent aspects of personal characteristics and teamwork. The correlation indicates that for high Task Management a high level of Expressiveness is required. This relationship found did not support that Task management diverges from Expressiveness but it is an additional piece of evidence that supports the key role Social Interaction plays in the accomplishment of team tasks.

Path-analytic techniques were used to test the fit of the data to the Social Interaction Models predicting Team Flow and Team Synergy.

The predictor variables in the present study, following the Social Interaction Model, encompassed measures of Teamwork Performance, examined as Team Flow and Team Synergy factors. The Personal Characteristics variables included gender role orientation-specifically, instrumentality and expressiveness. The teamwork interaction variables included Social Interaction, Trust and Task Management.

The Social Interaction Model is a Path model predicting Teamwork performance. Personal variables are Expressiveness scale scores on the Personality Attitudes Questionnaire (PAQ); and Instrumentality scale scores on the PAQ; Social Interaction are scores on the TAS Positive Social Interaction Scale; Trust are scores on the TAS Trust Scale; Task Management are scale scores on the Task Management Scale; All higher scores correspond to higher levels of that variable; for example, higher Social scores correspond with higher perceived Social Interaction. All hypothesized paths to the variables are hypothesized to be positive. Specifically, with respect to the Teamwork factors, (a) Instrumentality and Expressiveness will both directly and indirectly influence teamwork performance, with positive influences on Teamwork

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factors. Personal variables, (a) Instrumentality will influence Task Management, and Trust (b) Expressiveness will influence Trust as well as Positive Social Interaction.

A secondary purpose of the study was to compare the relative salience of Self Selected or Randomly Assigned group membership in the fit of the model. To do so, the model developed for Self Selected groups on a sample of Randomly Assigned groups for the same course was tested. It was hypothesized that group membership would be salient influence in team performance. It was hypothesized that the data from Self Selected groups would provide a better fit to the model than would the data from Randomly Assigned groups.

Next, in Chapter 5, an additional perspective provided by the data collected during the follow up study of a sample of four of the teams participating in the study is presented. Data collected in team observations and data obtained from interviews and focus groups, provide an understanding of these teams in their evolution through the semester within their small learning communities.

This section of the study was meant to (a) clarify the interpretation proposed of the constructs measured by the TAS: Social Interaction, Task Management and Trust, by examining the teams from their students own voices (b) present how the researcher believed the TAS scores match what the teams experienced as a small learning communities and examine if the score interpretation was substantiated, and (c) present the evidence and observations that led the researcher to her conclusions and to a deeper understanding of the meaning of the TAS scores in the experience of students working in teams with observed differences in their levels of Social Interaction, Task Management and Trust.

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CHAPTER 5

CASE STUDIES

In this chapter I present a "thick description" (Geertz, 1973) of four cases selected to illustrate an aspect of the variables that impact team performance. The case studies were conducted to help validate the TAS as an instrument for the assessment of teamwork in higher education. The study and description of the teams in their evolution through the semester contributed to uncover the conditions under which high performance teams might develop.

In the following sections, I provide a brief review of my case studies methodology and describe how I perceived the teams' processes and how I experienced the team members. I share a description of a selection of their gestures and interpret their symbolic meanings, and I quote from my tape recordings of them in individual interviews or a focus groups. I analyze each team regarding their Social Interaction, Trust, Task Management and Team Performance. Finally, I relate the observational and interview data and it's analysis to team scores derived from the TAS instrument and summarize my deeper understandings of the team process. I conclude with the integration of both sources of data.

Review of Case Studies Methodology

The methodology for the case studies shifts from a quantitative approach to the "thick description" (Geertz, 1973) of psychosocial analysis. Similarly, the role of the researcher changes from one of detached researcher to engaged participant observer witnessing human behavior with the purpose of understanding the meaning behind the

team members' actions and how these related to the team processes. Reflecting the changed role I took as researcher, my voice in this chapter, changes from the third person academic writing style of quantitative analysis, to the first person, which is more appropriate for a qualitative research study, where the researcher is the research instrument.

I conducted the research using an emergent ethnographic methodology that developed and changed according to the conditions in the field experience and the needs of the participants. I took a psychosocial approach to analyzing the data. External observation was combined with team members' self-report as gathered through interviews and focus groups.

Several of the teams from the quantitative phase of the study volunteered to allow me to follow up. After visits to a number of these teams, I selected a sub-sample for close and frequent meeting observations. Because these teams met at various places on campus and in the surrounding city, I created a meeting calendar so as to attend as many meetings as possible with each of them and to follow them more in depth and with regular frequency. From this sub sample, I selected 4 cases to illustrate differences in the presence of the conditions that lead to high performance in teams: trust, positive Social Interaction or Task Management.

Previously, students had been asked to sign up to schedule me, as the researcher, to attend their meetings and become a participant observer of their teamwork. When they completed their team project, I selected members of each of the 4 teams to participate in tape-recorded interviews and focus groups for three purposes:

1. to clarify the interpretation of the constructs measured by the TAS: Social Interaction, Trust and Task Management,

2. to get learn how team members experienced their teams as small learning communities, and

3. to enrich the study with team members' voices.

The inclusion of focus groups provided the time and space for participants from different teams to interact, discuss, and learn from each other about their struggles working on teams. My approach to team observations had to be modified, however. Soon after I started conducting the team observations, I realized that my note taking was becoming stressful to vulnerable members of one of my observation teams. I found I experienced the process of these teams from multiple perspectives. First, I was a student, who had lived through the team process on multiple occasions during my twenty years as a graduate student. Sometimes I experienced teams with great difficulty, other times I took great joy in our interaction and accomplishments as a team. Second, as an experienced professional in psychology, I was alert to the ways in which the human psyche manifested verbally and non-verbally. Sometimes the observer role was hard for me to play as my heart went out to those I saw struggling or suffering from mistreatment by others. To them I could only offer at the time my nonverbal eye contact and the full attention of my being, which was there with them and for them. Years of training, supervision and practice as a psychologist made me aware of the depth of meaning in human interactions that is manifested in subtle signs. My empathic skills allowed me to connect with students experiencing various emotions in their teamwork process and allowed me to perceive and name what other researchers with a different professional background may have been missed.

The instructor of the course introduced me to the students as a fellow student who was conducting dissertation research. During my presentation requesting their participation in my study, I also introduced my daughter, who was there to help me

distribute the questionnaires; her presence established my identity as a mother. During their team meetings, beyond my student-researcher role, I think they also felt in my presence as a caring maternal figure that was there for them and to accompany them on their journey. My presence seemed to be significant to those who had been shut down by the negative regard of their peers or those who saw me as a protective presence in regards to was happening to them on their teams. Members of teams, who had played a negative role, also seemed to feel embraced by me and gave me the opportunity and granted me the trust to listen at length to their experience on their team. Although my approach to talking with the team members was as an interviewer collecting data and mainly asking questions, students often told me, without knowing that I had been a therapist for 25 years before coming back to graduate school, that the conversations felt therapeutic.

My behavior as an interviewer and leader of the focus groups communicated my respect and unconditional acceptance of the students, and they perceived me as trustworthy. Students' trust in me was evident in the extensive and open sharing of their teamwork experience. I believe I established close connections with many of the students through my silent presence in their meetings and by paying full attention to their interactions.

In the descriptions that follow, my personal professional story and predispositions as a student, team member, researcher, therapist, and mother play a role in the descriptions that follow.

CASE STUDIES

In this section, I describe the 4 teams I selected for deeper engagement and more prolonged study.

"We are winning this"

This team is an example of a community that achieved high performance .I chose this team for closer study because it enables me to address several of the elements my quantitative data suggest are present in high performance teams, in particular, Trust, positive Social Interaction, and Task Management. I will use this team as a basis for contrast with the other teams regarding the other factors in their performance. In this section, I will describe first the team mean scores and second how the TAS variables Social Interaction, Trust, and Task Management, look in action and in the team members' interaction.

In Team A, three students were males and six were females. Their mean age was 20 years. Two students were 19 year old, five were 20, and two were 21. Three students were seniors, three were sophomores and three were juniors. Five were Caucasian, three were Asian and one was Hispanic. Five students were from the College of Communications, two from Liberal Arts, one from Fine Arts and one from Natural Sciences.

This high presence of Trust, positive Social Interaction, and Task Management is related to team members achieving their goal at a higher level then they could do individually on their own. The team's strong performance reflects that the community they built was a source of strength for each of them. They were strong links in a chain and when they needed support, they were strengthened by each other. In many ways the team was like a key chain with multiple keys to open different doors. As the team project was multifaceted, each one brought the key needed to come into play at the moment when their unique talents were needed.

Each member was key to this team's achievement. The community the students built was a source of strength for each of them. Their interaction was built on respect for their individuality and an acceptance and positive regard for the differences among members of the team. The acknowledgment of each member's gifts and skills by their peers made each member feel valued.

Their open and relaxed communication helped them to get to know and trust each other at a deep personal level. There appeared to be little defensive behavior and their alliance with their team made them work assiduously to contribute their best, not so much to be better then the rest of the class teams, but to do their best to support the team. This level of performance was reflected at the end, not only in their subjective experience of teamwork, which was in the top 5 percent of the class, but also, when the questionnaire data was collected early in their team process, their Team Synergy and Team Flow scores were higher then the class mean. Both scores reflected the team's high level of engagement maintained until the completion of their project (see Table 21)

Table 21: Team A Mean Scores

TEAM A Self Selected Members	Instru-mentality	Expre-ssivennes	Trust	Social Interaction	Task Management	Team Flow	Team Synergy
Group Mean	3.68	3.77	3.58	4.14	3.95	3.22	3.78
Team A	3.64	3.76	3.84	4.28	4.05	3.46	4.06

External observers that judged their work also gave them a score above the mean reflecting the results of their effort. It is likely that the interaction the observers witnessed between the team members was also very positive and demonstrated how closely and effectively they worked together.

Some of the members of this team knew each other from previous courses they took together in their same department. The other members joined the team as they got

to know each other from sitting nearby in class. The team was a mix of self-selected members who knew each other superficially and a member who was sitting nearby and asked to join the team. A female student interviewed said:

> I met Cesar the very first day of class. We were supposed to turn around and meet the person behind us and he said he liked my hair, and I said I liked the color of his shirt. That's why I met Cesar. We sit in the same row in class, so after class we wouldn't have to hurry on and find each other. We would all just kind of be like, "OK, we will meet tonight" or because we sat really close to each other it was easy to organize that way and also the website helped, too.

Social Interaction

Team A created an environment that made its members outperform expectations of other teams in the class. The students in this team exhibited a positive attitude toward each other that was based on respect and acceptance. They became truly committed to their project and ended up succeeding in forming a community in which they learned, helped each other achieve the team goals, and became friends with each other. I met with a female student to conduct an interview after their project was completed and when I went to meet with her in a private space, the other two teammates wanted to come and join us for the interview. During our small group interview just after the end of their team project, one of the students said:

> When the project was assigned, none of us really knew each other really well, I knew Lin decently, and Jane is friends with my best friend. But we really weren't friends to where we would call each other on the phone and be comfortable talking on the phone or be like "oh, let's hang out" I called Leslie before to hang out, and when we get together it's not always about work, we have a goal which is to get our work done, but also it's like you are being with your friends and you are getting your work done so time flies when you are working with your friends.

> I got to be better friends with the people I knew fairly well like Carrie, who I barely knew. Now she comes over to my house like every night

The first thing that I heard from a young man who was standing in the front of the class as he started the meeting was "we are going to win this fair". They were there to do their best and to obtain the best possible grade they could achieve together on their team project. He was able to encourage the team to be there; not only were they physically present but they also actively engaged on the same quest.

> I think that at certain points everybody came in. Shannon and Cesar seem to come through the strongest and the leaders just because they ended up putting more things together than the rest of us.

When in their meetings, most of the team members looked happy, smiling, and were engaged in a lively conversation. During their discussion they would have ideas to contribute and appeared comfortable enough to say whatever they wanted. All of the members were also respectful to each other and allowed everyone who wanted to speak to have their turn by listening.

Throughout the time I observed them, the team members developed closer working relationships and manifested positive feelings toward each other. By the end of the project they had become very good friends; they looked after each other, and they knew what was going on in each other's lives. One of the female students said:

> It was like you are not just my MIS project people anymore; you are my friend now that we can hang out together without the project too.

> Celebrating together is also a way of bonding with each other, like we are not only teammates but we are friends, we accomplished our goal together and we are proud and happy that we did it and now we can celebrate.

They felt comfortable being in close physical proximity to each other while they engaged in conversation before their meetings started. The students were also psychologically close to each other despite the team's mixture of cultures. Even though

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Asian cultures traditionally maintain a larger physical distance between two people, I could see the Asian students reducing the physical distance as a result of feeling comfortable in their psychological space with their teammates. In class they made an effort to sit with each other and were able to communicate and plan easily with each other.

The team was varied in their composition. There was a Hispanic girl in the team, Lucy that played the role of the emotional leader. She is in school doing additional courses to have a double major. She performed a special function in the team, which was to be very close emotionally to most of the members of the team. She was very much in touch with where everyone was in their tasks. At the same time, the unusual positive social interaction allowed her to ask for updates on the team tasks. Her requests were well received by the team members because the basis for the interaction had first been established through dialog. She had established deep levels of trust with other team members based on her openness and demonstration that she cared for each one.

> I can communicate fairly effectively. I think I could be better at it, but I am more of an empathetic person, and I like people, and I like having fun and having a good time. I like to make people feel special, and when people are feeling bad, I like to point out their good qualities. If they are being really hard on themselves I like to step in and say "You don't have to think about right now, think about these positive things. You might have this going on, but look at this other good thing."

This view was shared by her fellow teammates. The following comment about her, made by other female students, reflects the way the teammates saw her:

> Lucy was super sweet, and she got everything done. Lucy was amazing. She went out, and she got our sponsorship, she got our printing costs donated. She really didn't even need the project. She has already graduated, has her degree, and everything. She worried about our project, she did a lot, and I really appreciated her efforts a lot.

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> She was a good organizer, and developed a master schedule of what every one in the team had to accomplish in their courses during the semester. By keeping track of what each one had to do, they were able to realistically plan who could do what, when can each contribute and where they were in their process.

Lucy had the ability to establish dialogue to with each of the members of the team to make them feel comfortable to tell her everything she needed to know to be able to keep track of the team's progress. She was a friend to each of the team members and emerged with a leadership role that started as the emotional connection that served as the building block of their relationship.

From my experience with this team, the male student who started organizing the team ignited the team desire to excel in their work and "to win the fair". It. Cesar said:

> I think we met the ultimate, the very last deadline. We ended up meeting it because we set early deadlines for ourselves, like kind of to give ourselves that space in case something happened, and in case it did happen. And so we weren't late, like "Oh, my gosh the documents are due and we couldn't turn it in." We got everything on time

As I conducted observations in this team, I became aware of the different leadership roles played by the team members. The Hispanic girl was the emotional leader and the one who kept and took care of the positive social interaction between the team members. They talked with a tone of warmth and kindness to each other, of expressed care, mutual respect and acceptance. During an interview, the male leader who started the team said about her:

> Lucy was really sweet. She was super nice, and she is just a super, super sweet person, and she was just so much fun to get to know.

Between the two leaders, the team had two powerful members. But the others also manifested important leadership qualities. The team had another girl who was

intensely involved with the team in trying to make things happen. In my conversation with her, she told me that she was used to being a team leader. In this case, the other two members of the team were doing such a good job that she could relax and not do it as much. She still played a leadership role and was very involved in the work of the team.. But for her, it was a relief to find the load of this project being shared with others who were also capable of doing a good job.

The project had many stages and tasks to accomplish, and the team was able to negotiate who would lead a particular task. The team shared leadership. Each major responsibility was placed on the members who were most skilled at what was needed. Some of the comments about how the team shared leadership and used the talents of different team members follow:

> What really helped was that basically, Cesar was the manager at first, when we first were starting everything so that he just made sure that he kind of edited a bunch of our documents just to make sure they followed the same pattern and it really brought it all together. Later he would kind of briefly overview it and then added in his own personal flair so it sounded like the same author throughout the document. So it was good. I'm glad he was there and I'm glad he was so dedicated to doing that because it really added a lot.

> Shannon was the yearbook editor back in her high school, so she was the only one with the real technology expertise. She ended up compiling all of our stuff and teaching all of us how to use this program. Lucy did the sponsors and so we all contributed a fair amount I thought.

The team leaders shared the task responsibilities, and they were able to delegate leadership to the member who could benefit the team the most at the moment. No competition or struggle for control developed between the students with leadership skills. Based on my observations, it appeared unusual to have several students with experience in team leadership on the same team.

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Students in this particular team who did not play a key leadership role, shared in a focus group:

> Normally, in all the groups that I have been in, I have always been the leader, I've always been the one that says, "OK, this is how we get this done and here is the goal and here is the task". And he was kind of taking that over, and I was a little bit like, "well, hold on, and give me a second".

> I don't like to be overpowered by another person to where my opinion seems like, "Oh, okay that's great, you are just talking, I'm not listening, and here is my idea so we are going to do this." I don't like that, and I think if you were going to do teamwork, one of the most important things is to make sure that there is a balance of power, not where there is one person that does all the work, and then there are people who don't care. That's not good. And it's also not good for one person to tell other people what to do and have those people who actually do care but can't get their opinions across because other people in the group are so overpowering that like different voices in the group can't be heard.

Members of this team also commented in a focus group about the role of the team leader in serving the community: they need to make time to hear what members say and provide positive feedback. A student commented:

> Leaders are important in a group to get things going, to get deadlines and stuff like that, but the leader has to make sure to make it known that, yes, I am the leader, and I'm going to try my very hardest to benefit the group, but I also want everybody to know that everybody's opinion matters and that everybody has something valuable to contribute and not just because I care so much about this, and I have to get this done, and it's important me.   So, I think the balance of power and what a leader is able to communicate to his group is very, very important in teamwork.

> A leader can make his group members feel like, appreciated, like their efforts are appreciated, and if you submit your work to a leader that, he won't just overlook it or discard it or do what he wants to do. But that he will actually take your effort into consideration and make you feel like you actually contributed to the group because, I mean, what is a group project? It's where a lot of people get together to do one thing, not where a lot of people get together and one person does everything.

As noted earlier, this team had many "out of the ordinary leaders". Their leadership skills were obvious from their interaction with others, and it was natural for them to be a leader. It was an interesting experience to see how a group of leaders came together in a team. The team was effective in sharing the leadership role, making it a practice to give leadership to the one that had the leadership skills but also the skills that were needed at the moment to successfully complete the task. As their team process developed, it was obvious that they each member had a different leadership style A female student leader discussed the style of Cesar, the male student leader:

> As a leader, he is very unique. Normally when I've done group projects in the past, I've always been the leader and so, it's very difficult to adapt to his style of leadership which is very different to mine. He is very, like, take charge and like "I'm just going to tell you what to do" and I'm more like "What do you think? Maybe we should do this." It's difficult to adapt to this especially as a follower because I'm not used to following someone who is just like "Here, this is what I think". Not that he is a bad person, not that he is a bad leader, it was just different for me.

One of the things that this team did was to describe the skills they were bringing to the team table to share. Not everybody could do all the tasks to perfection. But they could bring their best efforts and contributions. They had a team member who was an excellent writer, they had a graphics designer, and they had someone very good with technology, which developed the private website for their team. In addition to sharing their best skills, high quality communication was evidenced throughout the months that this project lasted. Lucy, the female leader, described their process:

> Once the group meetings started, we ended up all brainstorming together with different ideas for the product. I remember we were each assigned to bring ten ideas, and some people brought more and some people brought less, but all together we had pretty good synergy once we started getting ideas. When we actually had to start assigning tasks for individual assignments, people did really good. We were trying to find sponsors so we all brainstormed who could do

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sponsors and then divided them between different people. It all turned out pretty well. If it was assigned, then the next week it would get done. Then we would all talk about it as a group all together, and if there was any conflict or problem with anything, we would either call each other, or the group website really helped. And Cesar created an actual separate group website for us to post any information besides that provided in class.

Often they started their meetings by checking with each other. They were able not only to share the tasks of the project, but also to share emotions at the deepest levels. They felt free to share who they were, what was going on in their lives, and what they were feeling at the time. I could see that each of them really cared for the others. The following comment comes from an interview with a student that got sick when she was out of town visiting her parents for the weekend and needed to come back to Austin so that the team meeting that was scheduled to be at her apartment could take place:

> I got sick, and I went to the emergency room because I had really bad stomach pains. On Sunday night, I had to drive back home, and it's a three and a half hour drive. So I was like, "I have to go back to Austin." My doctor comes in, and he is like "she is staying in the hospital". And I was like "No, because I don't live here, and I have a project to do". They were all meeting at my apartment at one o'clock and this was 12:30, and I didn't have my cell phone and couldn't contact my group. And I felt really bad because I was like, "They just will completely think that I just wanted to hang out at home and not come". They will think I ditched them, and I'm like, "Oh, my God", and my doctor is like, "No, you are not leaving. You have to stay here for at least another couple of days". And I was like "I have my project to do" and so I signed a consent form, and then we left, and I came back here, and we did our booth, and so everything went okay.

Lucy, who was their emotional leader, was always on top of other members lives, asking about their other commitments and struggles with school, asking others, "How did your project go?" Another important role that the emotional leader played was providing positive feedback that reinforced team members' sense of being

appreciated; therefore, they were willing to contribute even more. The male leader of the team described her in the following comments:

> Lucy is like a miracle worker. I'm sure for everyone; she is their favorite person in the group. Everyone is like, "Oh, my God! I love Lucy. She is like so warm and pleasant and such an awesome person to be around." I know that I am warm, too, but I am also authoritarian in certain ways. But Lucy is so incredibly nice, she is always smiling and such a happy and pleasant person, and everybody loves her. That is like what we use Lucy for. She got all of our sponsorships and all the donors. She got people to sponsor our group and that was all her. And then she would pull everything together. She is just a miracle worker. Things would just like fall together for her. It's like really awesome. I love Lucy and her attitude, and I mean I love everyone in our group. She is gifted in terms of the love she can give others, and you feel really enveloped by her person. And she's got such an awesome personality, like when she came into the booth today, we didn't have anything to say and just to the kids that were coming in she was so warm and charming to them. Like they just loved her. I was very nervous because we didn't really practice last night about what we were going to say today, and like, me and her were just bouncing back and forth, like what things we were making up to talk about and stuff like that. And she is just so very easy to work with. She is just like the perfect group member. She is assertive but soft. Right. And you can't be uncomfortable with her; there is like no one that she makes uncomfortable. You can see her in the eyes and feel good. It is very comfortable to be with her.

In regard to the role she played in the team, Lucy told me in an interview at the end of the project:

> ...I would always make sure everyone knew how special each person was, because it was important that we were able to appreciate what we had in our group. I think it is very important to keep everyone included, and I would try to make everyone feel like they were really great, because everyone was. I would just try to reinforce how important each person was to the group, so I would be, like if someone was really good at PageMaker, which we wrote our document on, I would make sure everyone knew, like she is so good at PageMaker. Y'all should congratulate her because that is so awesome. Or, Cesar, you are so funny. Your jokes are so good, we were able to add them into the document, and the document is so funny. Or, like Carrie is a wonderful painter, so I'm like, "Oh, my God! She is so good at what she does".

The team ended up bonding in an intense and close-knit fashion, becoming an extended school family for the members. In a family, you give to one another generously, and in this team, I often saw students going out of their way to serve one another or give of themselves. In the process of putting together their team product, they spent many hours in the library, and one of the students related to me that she was getting sleepy as it was getting late. She said that she wanted coffee. The male team leader disappeared to return with her favorite coffee. They knew each other well and manifested a spontaneous joy in giving to each other as you do in a family or with your friends. The following comment from the female emotional leader expands on this observation:

> I just think that I really took our group like a family and just the way you would do as much as you could, not for yourself, but for the rest of the people, like you do to your family and you forget about yourself. And so I would do for our group. Sometimes, I would forget about myself and just really work for the whole group as a whole. And I worked really hard to get our sponsors because I didn't want our group to have to pay money out of our pocket. There were some people that told me, "We need to get sponsors because I cannot pay money for this project." So, I always had the group in mind, as people, not just as a group with students in a class put together.

The team environment provided team members with the opportunity to feel valued about their talents and contributions.

The team members were welcoming and accepting. For example, there were already nine members of the team when the team started to be formed. One male student did not have a team to belong to, and he asked them if he could join them. The first leader and motivator told the student, "We are already at the limit of the number of people we are supposed to have in our group". He had such a good heart that he did not feel comfortable rejecting someone that wanted to be with them and did not have a team, so he talked to the teaching assistant (TA) and got permission for an extra

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member on their team. As the class was finishing and students were turning in their team member sheets, he ran to catch up with the student and told him that he had permission to add him to their team, and he was welcome to join them and belong to their the team. This was an example of how this team excelled at welcoming members into their corps and becoming one united, embracing team. The male leader of the team described himself as:

> I am pretty outgoing. I'm loud, I am kind of bossy, and I think I am pretty fun. I know I am very motivational, like I can motivate people to do a lot of stuff and get people excited about doing a lot of stuff. I'm semi-organized, I'm not very good at following through, and that is my big weakness. Like I can get people excited about doing stuff, but not like me actually doing it and completing the whole thing.

From his female teammates' perspectives, he had many special characteristics, as the following impressions from four of them reflect:

> He was very uplifting and he gave us a goal the very first time we met. He said, "We are winning this".

> He gave us that vision and his personality and excitement. If he hadn't been there with that personality and excitement and the goal that he set for us, then maybe we wouldn't have felt or had the confidence that we could reach this level.

> He is a very humorous person; some of us are very dry. He helped a lot cohesive-wise, humor wise, and then just his personality.

> He is also very intelligent. What helped us out a lot was that he knew the class back and forth, terminology wise, and concept wise.

During the meetings I observed how, by accepting and valuing each unique person, these students were able to become one team with one voice. Their final document represented a single voice, with a lot of humor. This feature of their project was not an easy task to accomplish, but one of the team members took all the individual pieces and

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made it sound like his voice, which was full of humor. The task required lot of editing. Some of the members welcomed his editing, but others were not so pleased. For some of the female members, having their product and their writing changed by others upset them. One of the female teammates said his changes to their writing felt overpowering:

> Most of the time everything went really smoothly. I got along with everybody. It was just really organized, and we were all well-mannered with each other. But at times, sometimes, it didn't feel like I had enough power in the group, but it was a rarity.

Task Management

The team project included numerous tasks, and the team excelled at managing them. According to the male leader,

> Keeping everyone on track was the hardest thing. We e-mailed each other constantly, and we all had each others' cell phone numbers and stuff like that, and plus, we see each other every other day in class, and we all sit next to each other, so it was easy oral communication. Pretty much everyone agreed, like eight out of the ten.

> I wouldn't say that I'm unorganized; I just have to consciously focus on stuff. I'm probably organized more than a lot of people personally, in comparison, with like all the other things that I have going on, and so like every morning, when I get up, I make a list of things that I have to do. That helps a lot so like I have a goal card every day of things that I should get done. Especially with the project going on and in context with the other classes because this is just like one fifth of school.

Lucy, in addition to playing the emotional leader support role, shared the monitoring of task completion with the male leader. Given her warm personal relation with all team members, her monitoring was well received and helpful in maintaining the flow of progress toward their goal. She said:

When we actually had to start assigning tasks for individual assignments, people did really well. We were trying to find sponsors, so we all brainstormed who we could ask to be sponsors and then divided them in between the different people. We met and found out what had to get done, and we'd make up a list of everything that we had to get done. And then basically, we allowed each other to pick what we wanted to do. So, who is good at what tasks; everyone has different talents, so we had one person who was really good at designing pictures and stuff like that, and our icon, our graphic that does the eye in nocturnal vision; our MIA who showed up the last week that it was due, we found out that he was really good, that he had a talent for drawing. So he did design computer wise, he did our logo, and he did some other stuff, and he did our PowerPoint because he was really good at PowerPoint. So it was kind of like, what our traits were good at, that's how we divided the tasks. Kind of just getting everything together.

I kind of stepped back and was kind of the monitor of things to do. So I would be like, is this done? Is this done? Our friendship, humor, dedication towards the class, everyone was very dedicated towards the class -- just that thing to have fun and not to make everything so serious and not everything too rigid. Nothing was in strict order, and that's what's good. I mean everything was organized, but nothing was straight to the book. We were able to just make everything the way we wanted and put our creativity into it and our ideas into it. There have been times in other groups that I've said, "No, if we could only have done this or this, it would have turned out much better." But I can honestly say that there were no regrets on what we did or how we did it. Everything was well planned, well organized, and we had backup plans for everything, just in case stuff went wrong. Everything fits like a puzzle. So if I would change one thing, the piece wouldn't fit, so we would have to change everything, so I think everything went well.

In this team the monitoring of tasks happened in a positive environment due to the relationship that Lucy had established with each of them. Another female participant gave me her perspective on the task management.

I think we met the ultimate, the very last deadline. We ended up meeting it, but because we set early deadlines for ourselves, like kind of to give ourselves that space in case something happened and in case it did happen. And so we weren't late, like "Oh, my gosh! The documents are due and we couldn't turn it in"! We got everything on time, but not for the time that set for ourselves.

The team was not always harmonious. According to Tucker's model of team development (1996), they reached the storming stage, characterized by conflict. In the group interview, the female students made the following comments:

It wasn't a perfect group. I know I definitely had a personality conflict with a couple of other people in the group, but I think that because it was such a big group, that it wasn't a big deal. If it was me and say Cesar working together, I could see us having issues just because his personality is very, very strong, that sometimes it's very hard to take. But because it was such a big group, there wasn't as big of an impact on me.

Everyone in our group was a good person, and I really like everyone in our group. But sometimes, we had our conflicts because we would see things differently, or Cesar would want things one way or somebody else would think some other way. And sometimes it was hard to decide with ten people on one way to do things, especially with the booth. We had a problem trying to get everyone to agree on one idea, but once we did, it worked out really well.

I could sit there and be fine with everything but then I would see somebody not feel comfortable and that would make me tense.

However, they had built such a strong base of acceptance and respect for their relationship. They had the trust and the openness to be able to deal, interact, and manage their conflicts to find solutions. They developed trust in two different regards: task accomplishment and sharing their personal lives and feelings in different degrees according to their comfort with self-disclosure and the closeness that developed between them. In an interview two female students reflected that,

We care for each other, and we let ourselves open up to each other and see our true personalities. So we got to know each other very well. I know that Leslie broke up with her boyfriend and got together again, and I know that Carrie got sick and was in the hospital, and we really got to care for each other, and that is what made us succeed. We also trust each other personally, and yes, we had a lot of trust, like I was saying, we had faith in each other that we would get things done.

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But I think that the reason we had faith that our document would get done was because we had faith and trust in our personal lives. We opened ourselves up to each other. I knew she was sick, but I knew she would get it done. I knew her personally, as a friend, so I had that faith that "Oh, she is my friend, so she is not going to let me down and not do the project or not write her individual section". Or I knew him as a friend, he became my friend, so I knew and I had faith that he would come through at the end, like in the project. So the friendship, the trust in our friendship is what that made the faith and the trust in our document.

Lucy, the emotional leader pointed out,

Get to know your members, because if you don't get to know them, and who they are, you cannot possibly work as one.

The ability to be open with other team members varied within the team. One of the male students said,

In general, I'm open, but at the same time, I'm pretty guarded. Like I'm open in some kinds of ways, but guarded in other kinds of ways, so people don't really know that much about my personal life or anything like that.

Trust

The team members openly shared their opinions with each other. As noted by one student,

Leslie has good leadership qualities, and she is real sweet. When she talks to you, she let's you know that your opinion matters. Leslie had a sketchbook of her drawings, ideas, and it was wonderful. And of course, if at times we didn't like the ideas or we didn't think we could do it, we would be like, "Oh, maybe not that one," and Leslie wouldn't take offense, because she is in it for the group's good. Like these are just ideas, and what harm could it do, where we have one more idea than we had before, but if we didn't want to do it, that is okay.

Another student remarked,

Carrie, was very like, I don't think I ever saw her mad, upset or worried. She was very uplifting all the time, "Don't worry about it, we'll be okay". If something negative came up she was always like "It's okay. We can fix it". And I think that also helped in our group keep everyone not upset.

They talked about the actions that troubled them and then explained how that action made them feel and worked through the possible solutions to the problem they were experiencing. No problems were put under the rug, nor heads stuck in the sand to pretend the problem was not there. Nor did they get stuck in the past. Once a problem was addressed, they addressed it and went ahead to their next issue in question. From Lucy's perspective:

> We had a person say, "Oh, there is a mistake in the printed document." But I said, "What is done is done. Give it up." "Don't dwell, don't cry over spilled milk," my mom would always say. Which is like if something wrong happened, move on, forget about it, it's over, let's go. And I would always say, everything happens for a reason. Because I truly believe that. I say a lot of things. What I was going to say, "A leaf from a tree doesn't fall without God's will", and I would always tell our group that because sometimes there would be some negative things towards our MIA. I would think it in my head and say it usually in Spanish, and they would be like "whuuuut?" and I would just say we're working good, so just go on, and I would say, "Punto y aparte" -- just go on. And I just tried to keep the flow going always.

In regard to the team task management they did a good job of keeping track of what needed to be organized. A student in the three female students' interview said:

> It all turned out pretty well. If it was assigned then the next week it would get done. Then we would all talk about it as a group, all together, and if there was any conflict or problem with anything, we would either call each other. Or the group website really helped.

> It really surprised me when he took charge of editing all of our documents. So, it's almost like, at first, I couldn't live with it, but then I don't think we could live without it. So, I adapted, and it all turned out well.

They faced their problems and managed the issues that were coming up on a frequent basis.   They also managed differences in points of view with flexibility. By working and negotiating with each other when in conflict, they reached a satisfactory solution, and were able to maintain the positive spirit of the team and continue to have a positive regard and feeling for each other.

> I do know from a lot of other people that are in the class. They ended up hating each other after this group project. Our group, we really got really close in the group, and we made friendships, and we were really happy after everything happened. I wanted to cry because we were really sad the last day of the fair. We were like, "We are not going to see each other again." We made it a point that we were going to try to keep in touch.
>
> I have been in other groups where there is one person who is such a negative person, and in this group, we didn't. We had people that were very -- if there were any negative thoughts, we always had other people to try and say, "Don't worry. It's going to get done." Or, "No, it's not like that, look at this." So it would kind of change, and they would be like, "Oh, okay. That's okay."
>
> What happens with a negative person is that they shoot down everyone's dreams and creativity and like I said before that is very important. Just because to dream the impossible dream, you know, like the famous song, or like to never put a cap on your creativity. That is really important. And a negative person is like, "No that is not going to work. That will never happen," or "That doesn't go," or "That's dumb." When you start shutting doors, you are getting claustrophobic almost, like everything is coming down on you. If you shut those doors, because that is what negative people do, and we didn't have that in our group. So everything was limitless. "We can do this", and "We can do this", and we had faith and confidence that we could get that done.

This case study enabled me to see the two distinct aspects of trust: task performance and interpersonal trust.

Personal and task trust were evident and formed an important base for the positive relationships that created a community where the environment was highly positive. As Lucy one of the female student leader put it at the end:

We would just e-mail our parts to Cesar. Then he would go to his website and post it in there, and we could all go on there and check everybody else's. Later he did give us a password and his username so we could post ourselves. But by that time it wasn't even necessary. We didn't need that but we could have because we had a password to get into all his files.

I think that that is also what made us succeed as a group. We extended our boundaries and we weren't just students put together to accomplish a goal. We were people, individuals, and we gave to each other. We let each other into our personal lives and our true personality. So we got to know each other very well. I know that Leslie broke up with her boy friend and got together again, and I know that Carrie got sick and was in the hospital, and we really got to care for each other and that is what made us succeed. We really worked together as a whole because that is the point of a group; you have to have unity to work as one, not a lot of different minds working on their own on their own little tasks. Everyone has to fit as a puzzle. It's just like a key chain, every single person was like a different key on a key chain. They all opened different doors within our project, but we were all held together by that key chain that held all the keys together. We were all still one.

Cesar would always tell me, "You know everybody loves you, no one has anything negative to say about you" and I'm like, "I didn't know anybody was saying anything negative about anybody else! I thought everybody was happy" but he would tell me a lot, and a lot of other people would tell me a lot. I wasn't there to be Ms. Popular, everyone's friend. I was just there being myself, so they liked me, and my Hispanic culture and my personality.

This team provided a special opportunity for me to see students struggling with a heavy load in their coursework, and caring for each other and doing their best so that the product would be the best. As noted by one student,

I felt it was incredible; the sense of accomplishment I felt when we got there was amazing. Especially considering we spent so many hours on it, and the booth we put together yesterday and at the beginning of the week. We didn't have anything and it looked really bad and by today it looked awesome. Yeah, I thought our booth was the best. I don't care if other people's was taller, bigger, or more colorful, I was like "ours is the best". Because we put to much work into it and I think that that is important for teamwork to have a sense of pride. And I really didn't feel that until the document started coming together and I was like this is getting going, going, going, and at the business fair I was like I am so proud of my group and of all the work we did together, it was just a really good feeling.

The last day I saw them after their grades were assigned and they knew they had won, some of their comments were

> We are not only teammates, but we are friends. We accomplished our goal together and we are proud and happy that we did it and now we can celebrate that we won.
>
> I think that that is also what made us succeed as a group. We extended our boundaries and we weren't just students put together to accomplish a goal. We were people, individuals and we gave each other, and we let each other into our personal lives and our true personality. So we got to know each other very well. I know that Leslie broke up with her boyfriend and got together again, and I know that Carrie got sick and was in the hospital, and we really got to care for each other and that is what made us succeed. We really worked together as a whole because that is the point of a group, you have to have unity to work as one, not a lot of different minds working on their own on their own little tasks. Everyone has to fit as a puzzle, it's just like a key chain, and every single person was like a different key on a key chain. They all opened different doors within our project, but we were all held together by that key chain that held all the keys together we were all still one.

From what I observed in this team and other, closely knitted teams, they appeared to create a safe environment that enabled participants to effectively integrate previously acquired knowledge from different courses with the new theoretical understandings emerging from the current course and then transform that knowledge into a coherent, contextualized, real world product.

The observations suggest that well integrated, united teams, tend to create a socio-psychological space that help develop respect, trust, open sharing and acceptance among the team members. Trust facilitated open and friendly communication that allowed the expression of ideas and the negotiation of divergent views into compromises that helped achieve the goals of the team. Positive social interaction also appeared to be intrinsically reinforcing. It strengthened the commitment of members to each other and encouraged them to give their best to their team project. The positive

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social interaction appeared to facilitate monitoring of progress, the provision of mutual assistance and support and the sharing of leadership tasks as determined by expertise.

In the process of studying this team, became aware of the power that shared leadership can have when the task at hand is complex and requires the use of the different talents within a team. I also realized that there are two independent but interrelated dimensions of Trust. As the normal process of development in teams occurred, and the tasks they had to accomplish were demanding, they were able to experience and resolve conflicts in a positive manner. Their relationship was important and they worked to maintain respectful dialog and not to hurt each other. My observations suggest that over time, many of them not only became effective teammates, but also friends.

Summary

From Team A, I clarified my understanding of teams in six areas:

1. Leading together makes a significant difference in team achievement.

2. Closely knitted teams, create a safe environment that enables participants to effectively integrate previously acquired knowledge from different courses with the new theoretical understandings emerging from the current course and then transform that knowledge into a coherent, contextualized, real world product.

3. It is important for team members to give positive feedback to reinforce each other and to recognize the quality of each others' work so members could feel valued and appreciated.

4. Acceptance of each others' differences creates a layer of respect that produces a feeling of comfort; important to be able to be open with each other.

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5. Trust develops in two different areas and at two different levels: (a) task performance and (b) interpersonal trust of each other at the level of what was going on with each of them. Interpersonal trust allowed sharing of who I am, where I come from, what I feel, and what I am experiencing.

6. Well integrated teams achieve a high level of engagement that leads them to enjoy being actively involved with each other in their process of learning.

TEAM B

"Our leader, never showed up"

This team illustrates that collaborative teams require strong task management and leadership skills to achieve the goals of the project. The high level of social skills manifested by this group was not enough to deliver all that this team could offer. As a chain, they were as strong as their weakest link, which happened to be their leader.

In team B one member was male and six were females. Their mean age was 19.14 years. Two students were 19 years old and one was 20. One student was a freshman and the other six were sophomores. Five were Caucasian, one was Asian and one was Hispanic. Four students were from the College of Communications, two from Liberal Arts and one from Fine Arts.

As shown in Table 22, all the team scores in the TAS factors were high. Team B demonstrated kindness, trust and positive social interaction between the team members. Toward the end of the project, the team's progress and effectiveness was damaged through lack of leadership and effective task management. At the end of the project the team members felt let down, and sad that they did not accomplish what they aimed for.

Although Positive Social Interaction was present, it was not enough to produce a high quality course team project.

Table 22: Team B Mean Scores

TEAM B Self Selected Members	Instru-mentality	Expre-ssivennes	Trust	Social Interaction	Task Management	Team Flow	Team Synergy
Group Mean	3.68	3.77	3.58	4.14	3.95	3.22	3.78
Team B	3.71	4.16	4.06	4.58	4.07	3.57	4.02

As shown in the table Team B Mean Scores above, Social Interaction and Trust were among the highest in the class. Important clues can be detected from the score patterns. The mean team instrumentality was close to the group mean, and Team Flow Engagement was also close to the group mean. As the path analysis showed, Team Flow, interpreted as Engagement, has a higher association with Task Management. When compared with the group mean, the Social Interaction team mean, was very high. Team Synergy, which was also high, is related to the quality of interpersonal interaction. Even under stress while their leader failed, they were still pleasant and understanding of each other. The behaviors the team exhibited toward each other were kind and friendly as I was able to observe them, but the team performance deteriorated and did not reach their full potential because of the lack of leadership at the closing stages of the project.

My first impression of this team was that it was younger then the other teams I had observed and was also unique in that it had only one male student. Their voices were softer and lower in tone than that used by older students in other teams that used a more assertive or commanding tone of voice. The first night that I went to observe them, one of the first things that I heard from one of the girls on the team was, "Hey, I just baked these cookies for our meeting, I want you to enjoy them."

All of them had a light in their eyes that reflected a smile, and they appeared excited to begin a new adventure in school. It was not easy for the young man to be in virtually an all-girls team. But, the handsome young male student seemed happy to be pampered by the attention of his teammates.

They seemed to be happy to have him in the team. His presence seemed to tint the experience of all the girls around him. His views had a degree of difference when they were dealing with what they were going to do as a group project. As a democracy, the majority wins, and his views of what they could do as a team product didn't prevail. He also was not a leadership role during the entire project.

Task Management

The leadership role of the team ended up being assigned to one of the female students who, at a critical moment at the end of the project, failed to complete her assigned tasks. This made it difficult for the team to have sufficient time to do their work together. One of the female students of Asian origin that came to a focus group said:

> At the beginning we really bonded, and still towards the end we did, but as the semester went on, we had a problem with our manager who is really on top of things and stuff and bringing everything together. She didn't let us down, but we were expecting things from her, and she, like she kind of wanted to do things her way and did not work out. She could not handle it.

> At the end, we did not really have close friendships, but definitely more than just classmates, and you know, we're gonna see each other again, and definitely spend some time together, like lunch or something.

I chose to follow up this team in their meetings and report on it because of the clear and highly evident positive social interaction between the team members. In the

course of the semester I was surprised that the lack of Task Management by the team leader, started to cause the team's performance to crumble. As the days went by the team faced the difficulty of having a leader that appeared unable to lead them to successful completion of the project. Often in the team meetings near the crucial point of needing to complete the team project, she brought up the advice she was receiving from her father on different details of their business plan.

In this team the students were younger than the students on the other teams. They were more at the beginning stages of their college experience. In addition, their experiences of college team projects and their teamwork skills seemed to be at an earlier stage of development than other teams I observed.

A special characteristic of the interaction of this team was their warmth as reflected in the physical closeness and contact between the female students. Also their tone of voice was pleasant toward each other even when they were stressed and were anxiously waiting to complete their product.   As one member described,

> The day before the document was due, our leader, never showed up. We had a really good environment, and we really liked hanging out with each other. Like we went out after we went to see one of our sponsors and all the sponsors, and we went out to eat, and it was fun getting to know these people that I think are really cool.

Most of the girls and the male student met their responsibilities and expected activities of on time as they had planned. This team gave every indication of being a successful team until one day before a major milestone of the team project was due. I met with the team on a Sunday morning (we were together until late the previous evening) when the team was to integrate the individual pieces so that it would be written in one voice.

Instead of observing the positive and productive completion of their project, I witnessed instead the disintegration and demoralization of a promising team. The experience was quite interesting because the team members were expected to meet for a few hours to finalize their project. I was expecting to see how this team would come together. But what happened was far from my expectations.

My surprise came from the girl who assumed the leadership role of the team and who, at this critical phase of the project, appeared to lack the leadership and task management skills required to help the team effectively complete the project.

Each of the team members had completed their own contributions. But the leader had not completed her piece, which was vital for the integration of the pieces of the others, and the whole document could not be assembled. She briefly appeared in the dorm conference room at the start of the meeting. She then left to finish her piece. Throughout that Sunday, the hours passed slowly. She knew that everyone was in the building waiting for her, but her part was not ready. It was noon, it was four, it was five and it was nine in the evening, and her part of the project was not ready. She seemed anxious, and appeared under great stress and pressure. Much later, she brought her part to the team member in charge of printing. By then most of the team members were already gone.

By the time they put together the document, which was due the next morning, it was quite late at night and there was no time for everyone to see how all the parts fit together as a seamless, integrated document. The document therefore wound up being more of a collection of individual elements as the leader's part was crucial for the others to flow. And it did not happen.

> I don't know why she didn't do what she had to contribute on time. She did kind of fall through at the end, like when we were putting the document together and

everyone else came together, and she did not. I think if we would have had everyone being leader from the beginning and not until the end, we could have done better. We weren't too dependent on that person, but we needed her contribution.

After that major milestone, the team continued to deteriorate. The final break came when it was time for their major presentation. The team leader failed to bring all the things necessary for the team to set up their presentation appropriately.

> We had an art major in our group and there was so much lack of communication, I mean she was willing to draw the whole booth. She really drew the whole booth.

> But we had our booth sketch and everything and at the end. We wanted to get it done before thanksgiving, so at the end, we realized there was not a sketch. It's like we delegated power, and these people did not do their end, and so in the end our booth did suffer. Because then she had to do as rush and do anything, and it could have been far better than what it actually was. We could have communicated better.

The team did not have someone who was perhaps older or more understanding of what was going on so as to recommend a change in leadership in the middle of the semester. Although the team manifested an incredible amount of kindness, positive social interaction and trust, ultimately the team broke down from the lack of leadership.

So at the end of the fair, the team failed to achieve a high quality product. Although some of the members had worked hard to do their part, and the points for that were, in general, higher than in other teams, they could have done better if the leadership had not let them down.

> In our group, when the document was done, that was when it got not good. Yeah, because we didn't really know except for like the day before we had to set up. Our manager just let us down and I think she just had too much on her plate, and she could have made some sacrifices like everyone else was doing, and she just didn't, and so we were kind of frustrated, and we realized and everyone came together and worked on it, and I don't know.

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Summary

From Team B, I clarified my understanding of teams in two ways:

1. Teams have a need for strong task management and leadership to succeed in a project. The lack of Task Management and leadership was largely responsible for the difficulties encountered by this team. At the end, they felt let down and sad that they did not accomplish what they had planned to achieve.

2. Positive Social Interaction is not enough for successful completion of a team project. Nonetheless, many of the team members built trust and friendships that may last beyond the semester.

For me, it was hard to be with them and just accompany them through the waiting process and to experience their frustration without being able to help them. It was very hard to be a participant observer without being able to give them any feedback, suggestions, and to help them use their own leadership skills to address their challenges.

TEAM C

As long as they do not win

This team, formed by talented members, evolved into negative social interaction that interfered with their performance. Although leadership was shared, the leaders' motivation was to outperform the team in which they had hoped to become members, but were left out. In turn, these hurt leaders rejected and discriminated against other team members, and, due to the level of aggression present in the team space, they failed to become a positive learning community. In the end, the team members felt they were in so much conflict, "they were about to kill each other."

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In Team C, five were males and four were females. Their mean age was 19.71 years. Three students were 19 years old, three were 20 and one was 21. Three students were Seniors, three were Sophomores and three were Juniors. Five were Caucasian, three were Asian and one was Hispanic. One student was from the College of Communications, and another was majoring in both Liberal Arts and Communication. Four students were from Liberal Arts one from Fine Arts and one from Engineering.

Team C suffered from negative social interaction that interfered with their performance in the achievement of their tasks. No student could feel engaged with a team where there was emotional mistreatment. Although this team had good task management skills, they suffered from negative social interaction that interfered with their performance in the achievement of their tasks.

In contrast, Team A had the ability to provide unconditional acceptance and respect. They had the ability to value and view each team member with positive regard, regardless of the external appearance.

Team C rejected team members and discriminated against them. Still the team survived the process because they had other a number of team members who made significant contributions. Unfortunately, due to the level of aggression present, they could not merge into a positive Social Interaction environment and form a positive learning community that supported their growth as individuals within one team.

As shown in Table 23 by the time questionnaires were collected, the team scores were already reflecting the fact that the team was not enjoying their work together, and they had a need for disengagement. The score that was sensitive to the negative social interaction was the Flow which was much lower than the class mean. Although social interaction deteriorated over time, at the point in which the questionnaires were

collected, the scores were indicated problems in social interaction. As shown on Table 29, the Social Interaction, Task Management and Team Flow were below the mean.

Table 23: Team C Mean Scores

TEAM C Self Selected Members	Instru-mentality	Expre-ssivennes	Trust	Social Interaction	Task Management	Team Flow	Team Synergy
Group Mean	3.68	3.77	3.58	4.14	3.95	3.22	3.78
Team C	3.82	3.66	3.83	4.05	3.92	2.91	3.78

Social Interaction

This team was the first team that I observed. My first impression of this team was disturbing, and it made me change my approach to study the team. I had planned to take the role of a researcher/observer, and I ended up changing it to become a participant/observer. My experience with this team struck me in many different ways – It was an interesting, yet sad, process to observe. I'm going to relate to you my first observations that led me to modify my approach in observing and participating with this team.

It was a Sunday afternoon when we met at a restaurant the university campus. When we got to the table and sat down, the first thing I heard was from a 19 year old female student who said:

> I woke up this morning with an intruder crawling out of my bedroom. The intruder left after turning the light of my living room off.

A team member asked, "Did you call someone?" She said "No I have not. I left my cell phone in the living room, and I could not move for a long time." A team member asked, "How did he come in?" She answered, "I guess I may have left the balcony door open". She also shared that she may miss the next session as her best friend's grandmother was

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dying, and she was going to the funeral. She appeared to be afraid and still in shock by the experience as I could see from her facial expression and tone of voice. She looked down and kept silent for a long time.

No one expressed concerns for her safety, and the questions tended to imply blame for the intrusion. At that point, she appeared to be looking for support from the team, as the tone of the voice suggested that she was having difficulty speaking of what just happened to her.

At that point, what struck me was the silence that followed after this person finished talking about the incident. The silence was accompanied with no one looking at her or offering any type of support to her. The team continued with their meeting. No one asked her, "How are you feeling? Are you safe? Did you call the manager of the apartment complex?" The female girls on the team looked very young, and I felt a call for help from the young woman in her sharing the incident with the team. As a researcher with daughters of her age, I felt worried for her safety and her need of support to deal with the traumatic event. However, in my role as a researcher, I kept quiet. I could only acknowledge her story by looking at her and with my eyes, to express to her that I cared. A few days later I talked to her after a class about the incident.

Later in the meeting, the young man sitting next to her extended his arm and told the team, "I printed these pages with the specifications of the project that we need to develop". He kept his arms outstretched with the printed pages and, although four or five people could reach the material, no one moved or responded to his offer of sharing the work he had done to fulfill the team task at hand. This work represented the development of the process to create the product that they would present at the fair. The team continued the meeting without acknowledging this person's contribution or efforts

to help create their team product. After he had kept his hands outstretched for a time, the girl who had shared the incident about intrusion into her house took the papers and offered to review them at a later time. Although the team members were present, they were not attending and responding well to each other. One of the female students that had a leadership role said in a focus group,

> Our group really like it wasn't terrible. We didn't have anyone missing in action, but like everyone really was present and came to the meetings and like it wasn't a problem getting people together, but mentally, there wasn't much there. I don't know where they were.

The team continued developing with most of the verbal interaction coming from the four female participants in the team. I later realized leadership in this team was shared between two female students who worked closely together. This is what one of the female students who co-led the team said about their shared role in the focus group they attended together:

> We're both used to taking leadership roles, you were more so, but I was still tried to exert my power or whatever it was that was there, not like anyone was listening to us, but we thought they were, so we would clash. She would be talking, and then she and another girl would be talking, so the three of us would be trying to organize, but we don't really think that mattered if we got heard anyway, so we were just fighting about things the whole time.

John, one of the male students who ended up in strong conflict with the team leaders attended a different focus group and provided his views of the evolution of their team process as reflected in his comments:

> In my group, we hum, we were kind of engaged, we were like "yeah, we are going to do good" but since there was no cohesion, tension started building up and people weren't going through with, they were trying to be on schedule, …like were throwing around ideas like in our group, and we tried to do things right. But I think what happened was that, there were four girls that started

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taking on more stuff, and then when things weren't getting done they were getting mad.

Other student and myself, we were kind of getting behind compared to where they were. They were complaining, and we were getting mad, you know, pissed off, and it just seems that thing blew up at the end and like there were arguments.

We didn't have any sponsors, we thought we had a sponsor to make the fair the banner, and the manager they had told Lisa that they would make it for free, we ended up getting a 20% discount, with Home Depot… so and luckily there were four people in my group whose parents worked for big companies so they sponsored us, but it's like we didn't, we didn't find sponsors, we didn't do the right thing so in the end that kind of blew things up because the girls spend $100 dollars each, and they wanted more money from us, and we got to say well, "I'm poor and I can't put any more money in".

John described how the team social interaction deteriorated as time went by and the team leaders became increasingly frustrated.

Need for Change of Methodology

The composition and dynamics of the team guided me to change my approach to performing my research. In my first visit to observe the team, I sat at the end of the table in the coffee shop where we met. There were several people who appeared anxious about my presence and the fact that I was writing notes throughout the session. I sat between two female students and they were curious about what I was writing. My notes were coded so that only I could understand them and, as I perceived the general uneasiness of the students, I realized that my first duty was to protect the students from any harm. I was being allowed to observe and learn from them and my first concern had to be their well being. I could not do anything that would harm them and if my note-taking was causing stress to them then I had to stop.

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As an example of what made me aware of the uneasiness and level of stress in the team was the behavior of a male student sitting at the other end of the table.. He drew my attention as he was experiencing frequent contractions in his facial muscles. His shoulders would contract as tension increased, and he would lower his head as if hiding behind his open laptop. He spoke very few words during the first meeting, but when he did speak his rhythm of speech was in irregular bursts of a few words.

I saw a few team members becoming curious or stressed about what I was writing about them. Observing these behaviors made me realize that at that point, that I could not continue with my original note-taking research plan.

As a participant observer, I decided that I would not take notes while I was with them. Instead, I would attempt to quietly sit and merge with them so that they could get accustomed to me and be comfortable with my presence.

I believe this change provided me with an opportunity to better observe the dynamics of their team processes.

Competition vs. Collaboration

The team environment, deteriorated with time. First of all, in contrast to the first two teams, the leaders' motivation was to be the winner of the fair because they didn't want others to be better than them. They wanted to compete with another team that the two leader girls had wanted to belong to and had been left out of. They wanted, more than anything else, to surpass the achievement of the other teams. They demanded from the rest of the team a performance that was not motivated by the desire to do their best, but by the anger they felt for the other team. In some ways it appeared that their anger had been displaced to the new members of the team, as they struggled to surpass the achievement of the other team. They demanded a level of achievement of their team

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that the other members had trouble reaching, and when their work was not up to the leaders' high standards, their dissatisfaction served to negatively impact some of the team member's contributions and feelings. One of the female leaders said:

> I feel like our team was effective, but also I feel that it was a messed up team and we were a team within our team almost, there were four of us, well, even there were two of us. We did the entire document; we were basically just telling people what to do. We were the leaders, but we were almost the whole group. People would, you know, begin to be like ugh!
>
> You know, they make it seem like they had stuff to do, but then they actually didn't do anything. They would give us a lot of grief, if we asked them to do something, all of a sudden such a big deal and we actually had a lot of problems on the set-up day.
>
> I think the people that didn't help made it more ineffective. Like if I would have just had that assignment from the beginning, then I could have done it right. And that also reflects on, I don't like working in teams, I like to do things myself because I'm really anal. Ja ja
>
> Yeah, I just like things done my way. It's hard for me to like, like, I can listen to other people's ideas, and I can let other people have their opinions, but I just really like to do things my way if my grade's on the line, and I don't like to depend on people when my grade rests on that.

Unfortunately, the team had links in their chain that were weakened by the pressure imposed by the two female leaders who wanted their team to outperform their friends and rivals on the other team. The pressure became a deterrent to the performance of their fellow team members. Some team members could meet the leaders' expectations, but others couldn't, and that made them experience the anxiety such as described earlier in the male student. This level of anxiety continued to increase as the pattern of interaction continued in the same manner throughout the semester. The leaders' view of team members that were contributing below their standards was negative and demeaning. The leaders were not aware of the emotional reaction of their

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team members to their interpersonal behavior. One of the leaders described her evolution with her teammates and with her roommate, who was also on the team:

> We had all of these disqualifiers, and we were just like, I dunno, I'm not sure about this, and he was like, no, I don't like this idea, your stupid, terrible idea. And then we'd get in these little tiffs with him. But in the end, that's something we can joke about and something that we can still be like, you're a jerk, and he can be like, we'll you're a bitch, and we're still friends. And we'll laugh, and it's funny and we joke about it, and like now we're friends with him and like I dunno, people I was less close to, I'm definitely closer with them now.

> Yeah, like we got really close because "we knew" how much the other three people sucked, but they really dragged us down. So you know, we're all friends, we hang out all the time so we still talk about it and we're like, those people suck.

Their meetings went from being slightly stressed in the beginning to difficult and strained toward the end. Later on in the semester, the interaction became so negative that it was not only tense, but also hurtful for the team members. It was difficult for me to observe the impact that the team's interactions were having on a particular student, who was being discounted in their interactions. My heart felt compassion for John, a particularly stressed student, and I couldn't do anything for him. I was there only to do team observations, however I had established a connection with John. In the second meeting that I attended, everyone arrived and sat at the same place. I usually waited for everyone to find their seats and then I would sit down. There was an empty chair where this male student sat. On this occasion he wasn't there, so I sat in the chair located at the end of the table where he was sitting before. Later when he arrived, I started to get up from that chair and said to him, "Let me give you your place", so he asked, "Do you remember where I was sitting?" I replied, "Sure, this is your place". He smiled and said. "No, please stay, I will bring a chair". This incident established a connection, evident in his eye contact when he smiled back at me. My interpretation

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was that by trying to give him the place he had in previous meeting, he had received from me an acknowledgement of his presence, of his belonging to the team. Although we interacted very little later on, other than the formal exchange of greetings, the connection was established, and he participated at the end in one of the focus groups and described his experience on this team. Some times when the level of stress in team environment became high, John would t turn to his laptop and interact only with his computer screen. One of the female leaders said:

> Some of the things that happened, there was that one of the guys brought his lap top. And he was on instant messenger the whole time talking to his friends and he was surfing the web, and making noise, and we were all there being quiet so everyone could hear, give input, like that was why we were there and this guy's doing all of that. So afterwards, I was like "John, please turn off, close your computer, we're gonna listen to you, you should listen to us, and it's only fair." He never did, and things like that and when he read his document it was awful. Like he read his part and we were just like, what you, you, are you spent all of your time playing solitaire at our meetings, so you didn't hear anything we said, so your document is awful. It just didn't work with any of ours.

> We said it, but in a way, it felt almost as if we were attacking him, like no one had anything positive to say to him because he hadn't done anything right. He hadn't pulled his weight, and we didn't want to attack him, because none of us are vicious-mean-people. So we all just wanted, we were trying to give people positive feedback, or healthy feedback but if we would have done that to him, we would have just torn his paper apart and made him, just you know? So it was hard to handle that, cause you don't want to give someone just constant negative feedback. It's not, you know, a good way to reinforce a relationship with someone you have to work with.

The team leaders knew that the team ended up with such a negative interaction that they said it was so bad that "they were ready to kill each other by the time the fair was over". The interaction continued deteriorating rapidly to the last day of the project. For the leaders, it was very difficult and disappointing to live through the whole experience, nonetheless. They were not aware of how much their own attitudes and actions towards the others influenced what happened: how they were not respectful of

the team members, and how their need to win and be better than the other teams had hurt their team. They didn't realize the ways they had contributed to making team members, who would have otherwise been willing to give their best, not care about the team's work. They were blind to how they repeatedly discounted the ideas of others, preventing them from providing as much valuable input as they could have received from them. As noted by one student,

> This week was like intense and we had a falling out really bad with one of the guys. Really, it was just at that point we felt under appreciated we were like, do you realize that any grade you get, any decent grade you get, is because we worked our asses off and you know, you did nothing, but everyone else, like Jorge like, we knew, we wanted him in our group cause we knew he was a really good builder and he had the resources. We were a bunch of girls, so we obviously, stereotypically, we don't know what we're doing, and from the beginning, Jackie and I said we wanna do, you know, we'll do the stupid tedious work cause we like writing, so we wanted to do that, and the guys were like, ok, like, is that cool with y'all? Yeah, and y'all do the building, we were like yeah yeah yeah. But then like it came down to it, and so that's why we didn't mind as much at the time, doing the document so like after the document, we're done, we don't have to take as much responsibility.

Contrary to the teams that excelled in their team process, this environment went from having superficially socially acceptable interactions to a very aggressive environment, an environment that was difficult to work in for the team members and which provided a frustrating experience for the team leaders. One of the two female leaders shared in the focus group, comparing their team with what she was learning from other participants,

> We said things all the time like we realize what we're doing, and realize that we all need to start doing a little more. We told them how we felt towards the last few weeks, that they needed to pick up the slack, but we never really had a session where we just talked and we could have done that at the beginning for sure, and we definitely should have done that.

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I don't think we had the interests enough in each other, as to discuss. I didn't have, honestly. I didn't have interest in the other people. I felt like they didn't care about me, and I didn't really care about them. You know, it sounds terrible to say, but I didn't care to get to know them more, I didn't like them.

I think what dragged us down so much, is we did not, we didn't care about each other. We cared about the project. I think that's where y'all are so much better, y'all enjoy being together.

At meetings, we were seriously watching the clock, thinking how much longer do I have to listen to this person talk because they're taking forever! Ha-ha

As the semester progressed, the interaction became unpleasant and the way they greeted each other was short and forced. Nobody enjoyed being together by the time they were ready to integrate the pieces of the product, and the meeting, which lasted several hours, was stressful. Feedback became rude and aggressive. Therefore, instead of polishing each other's work and having the openness needed to receive criticism, they were closed and defensive.

The stressed male student received a lot of criticism and the conditions to receive help or assistance from constructive criticisms were not present. In the focus group, he talked about this interaction and the way he saw his team failing to achieve a sense of community. John said:

My team was fairly effective, we discussed a lot of things but in the end some people we didn't follow through and stuff, but most of us were effective, but it wasn't, we could have been more effective.

All members of our group, we didn't bond. There were different groups when we came together and we were getting stuff done. But latter as soon as the meeting was over, we left. We just went our own separate ways. There were two people that they weren't really doing that much, and four people that were doing most of the work. Some were volunteering as they had cars.

So when they ask me, I couldn't. It's like you couldn't get any materials and couldn't get sponsors. They had cars and they were able to go, whereas for people without cars, like other student and myself, it was harder. Um, I guess

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For this student the team did not provide an environment to grow. He suffered by the way the team leaders related to him and he responded by withdrawing more into his computer and surfing the internet during the team meetings. At the end, he felt very frustrated with the way their team process developed. The process was also hard for the team leaders in that the process of competing ended up with a team that did not become a nurturing community where everyone could be appreciated and contribute their best. The result was a negative experience that left them saying in the focus group:

> The fact that maybe you were working very hard, and not everybody was at par with you made it hard. I kind of built some resentment. I really have never had such a bad experience. I was in tears after meetings because I really, and I worked the hardest, and it was ridiculous how we ended. We were yelling and putting our booth up, when we'd get in an argument they were like, you didn't have to do it, and it was like "what, were you gonna do it? Noooo! You weren't doing it, someone had to do it" and they were like well you didn't have to, and like then it wouldn't have gotten done, you know?

The following quotes present two perspectives, the side of the team that pushed members to achieve to their standards to compete with another team and the effects on the vulnerable member that suffered the bitter pressure and who, ended up disengaging himself from the team. Next is the view from one of the female leaders:

> The more I worked, the angrier I became. Like I really think that there were like three or four of us that did like everything, and there were like four or five people like sometimes they pulled their weight like maybe for five minutes, seriously. And I really, like I I'm a grade fanatic. I have to make A's. I have the sickness I swear. I can't handle having a B, so I wanted my whole group to have the mentality to like work hard, but it's fine that they didn't, but then that made me that can be like, oh well, I'll pull my weight, they pull theirs, oh well. Like, I had to do my work plus their work because I'm obnoxious about that, and that probably pissed off a lot of people working with me because I am like this has to be done three weeks in advance and everyone else was like no, just in time.

To conclude this is John's view of what resulted from their teamwork interaction:

> There's a couple people I've thought of, I'll say hi to them you know and the rest I'll never see these people again and I don't intend to. My birthday was December 1st and we were there, and I didn't enjoyed telling them, because there were times where when they would just say that I was wrong, and things would come across like, okay, just forget it. Anything that I said was being disregarded. If you are gonna talk down to me, just shut up and I'll leave, you know? Why say anything, just lets get this crap over with.

The female team leaders having experienced a deep wound from their sorority friends, in turn, hurt the other team members' deepest feelings. They looked down at some of the members of their team. This type of interaction created a climate where no one felt welcome. Conflict grew more intense as time went by. Although the external appearance was that of, "we are going to make a great product," at the emotional level, they could not put their best efforts together as they were stressing each other, and destroying each other's opportunity to grow and learn together.

In contrast with Team B, this team had good task management skills. They, however, suffered from negative social interaction that interfered with their performance in the achievement of their tasks. No student could feel engaged within a team where there was emotional mistreatment.

In Team B, although stressed and sad, their warm nature prevailed under stress and although they were looking sad when they presented their product in public, they were not fighting or wishing to kill each other.

In contrast, Team A had the ability to provide unconditional acceptance and respect. They had the ability to value and view each team member with positive regard. Unfortunately, Team C could not develop a positive Social Interaction environment and form a positive community for their growth, due to the level of aggression present. The

presence of aggression created frustration and, to protect themselves from more harm, members of the team withdrew from close interaction. The team members wanted to be together as little as possible to avoid conflict. Still the team was able to survive the process because it had many good members that had a lot to contribute.

Summary

From Team C, I clarified my understanding of teams in two ways:

1. Negative social interaction interferes with team performance in the achievement of their tasks. No student could feel engaged within a team where there is emotional mistreatment.

2. The presence of aggression creates frustration and, team members withdrew from close interaction to protect themselves from more harm.

3. Motivation to compete with others leads to killing the spirit of becoming one learning team.

The leaders' frustration and drive to compete with those that left them out in turn hurt others who, to protect themselves from more harm, shut down from close interaction. The team members wanted to be together as little as possible to avoid the conflict at the end, as they felt they were in so much conflict that, as expressed by one team member, "they were about to kill each other".

TEAM D

"I can call this mine"

This team illustrates the importance of a safe team space where team members can interact and be together. Just as one apple can spoil the others, one member's

aggression can make the other members become guarded and unproductive. In this team, trust did not develop at all. The team was did not demonstrate engagement in the team's activities nor did they enjoy each other's company.

Team D was formed of students selected at random to be in a team. Four were males, and five were females. Their mean age was 21 years. Two students were 19 year old, one was 20, 2 were 21, one was 22, and two were 23. Three students were seniors, three were sophomores and three were juniors. Seven were Caucasian, and one was Asian. Three students were from the college of Communications, five were from Liberal Arts, and one was from the College of Education. Next their scores in the questionnaire factor scales are presented.

The condition of a safe psychological space in which to interact and form a community where members can grow and develop their skills, were not present. As shown in Table 24, the three factors, Social Interaction, Task Management and Trust, were below the mean as was their performance in the team project.

This team illustrated the damaging effects of negative social on the people involved. It illustrated how the aggression and control of one member can make the others become unproductive. Trust did not develop at all. They were not engaged nor did they enjoy each others' company. The three factors Trust, Social Interaction and Task Management were below the mean and also their performance on the team project, as can be seen in Table 24

Table 24: Team D Mean Scores

Team D Randomly Assigned Members	Instru-mentality	Expressi-veness	Trust	Social Interaction	Task Management	Team Flow	Team Synergy
Group Mean	3.68	3.77	3.58	4.14	3.95	3.22	3.78
Team D	3.57	3.60	3.49	4.00	3.65	2.68	3.81

Social Interaction

Team D made the deepest impression on me of all the teams that I observed. The very first day, the meeting was supposed to last for two hours, and although we were meeting on an early Sunday afternoon, thirty minutes into the meeting all the members were gone. The characteristics of their interactions produced an uncomfortable team environment. They appeared to be upset instead of smiling and freely talking to each other. Their eyes had a hard, frowning look. Their facial expressions reflected dislike more then anxiety. Words were few, and conversation did not flow. I did not observe any manifestations of a warm relationship among them. It was a choppy presentation of brief phrases that were picked up on by other members. Communication seemed to be blocked and dialog was full of effort.

When I left the brief meeting at the restaurant (35 min.) and went to the library for my next meeting, I arrived with a feeling of a heavy heart. Although I was invited to the meeting, I felt one of the male students was very uncomfortable with my presence. With time, I was able to establish a positive relationship with him and he allowed me to interview him at length. The social distance in the team members was reflected in the way the team was dispersed in the classroom. The leader described the team:

In class we don't sit with each other. That is something a group would do if we were really close to each other. But we don't, one person sits in the front, one in

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the back. I sit in the center aisle, we never sit together. We never really pay attention to each other in class, only outside of class. Yeah, we don't study together before the exam. We actually brought it up. We actually wanted to study together but I prefer to study alone.

The team members appeared guarded because of the aggressive expressions of the team leader. I felt for them because the way I experienced them, was quite unpleasant due to the imposition of only one member's perspective.

As an observer, it was the first team I saw that demonstrated consistent negative social interaction. Collaboration on the team tasks was forced throughout the project. The motivation to participate was tat if they won they did not to have to take the final test. A team member said, "We ought to do it. We are demanded to do it."

Their social interaction, although polite, had a tone of distance. As they could not initially come to consensus, they agreed to design their booth later and in the mean time, make up a budget for wood supplies and whatever other materials occurred to the person in charge of the booth budget task.

Interaction was guarded and careful in their meetings. This is how Rodney, the team leader, described their interaction:

> We would never stay longer than we had to. In the meeting, it was always let's get in, do what we have to do and get on with the rest of our lives. As far as anything deep or really problematic, nobody brought that up because it would just bring down the group I think.

Rodney did not have a car, so one of the teammates sometimes gave him a ride to their meetings. On one occasion, the girl driving him became a listener to his cell phone conversation with his father, a relationship difficult for him. He said:

> I was being picked up to go meet at the Coffee Shop, I talked to one of the girls and it was just like, what is your major and just basically table talk. But then my

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dad called and I tried to explain that my parents are divorced and stuff like that so she got an inside on my life.

My Dad and I don't get to talk that much because he is far away. So, I just talked to him there and I explained to her why I had to pick up the phone. I feel like I need to tell her why I had to take that phone call, because I believe in gentlemanly behavior you never pick the cell phone if you are in conversation, unless it's extremely important. And if it's extremely important, the other person deserves to know why. Yeah, its not that comfortable, like I don't really want to talk about my problems, let's get the work done. No, not like what is going on in your life, because I feel that school is like business, and business and personal life you keep separate.

So you don't talk about what is going on in your personal life in business unless you know that person really well. And there are different levels of friendship. It's like I work with these guys. I don't know if I can call them friends. To me they are more like co-workers/acquaintances. They are not really friends. With them it's more like we have this and this to work on, so we have to hang out, we have to do this. Friends you call to hang out because you enjoy their company, not because you have to.

Throughout time I observed Rodney, he appeared to want to work closely with his teammates but was guarded in his behavior and expressions He describes his limits on trust:

There wasn't too much social interaction, except that night. Actually one of the girls said they might have a party this weekend and that we were invited or something like that or that she is going to call us to come over this Sunday. Trust them enough to do their work, but not enough to talk about my life. Like a coworker, you just tell them this is what I need, this is what I want. Can you do this for me? That kind of trust, not the one where "I put my life on your hands kind of trust".

During the weeks of the project the team did not appear motivated to do their best or to invest significant efforts or individual resources in accomplishing the project. The day the team built their booths, one of the girls told me she was feeling really frustrated with their booth. She wanted to make it look better, but she could not do it alone. The rest of the members did not care or did not see the booth with the type of

perception she had as an art major. Unfortunately, between her work and classes, she

could not do more. In the focus group she attended she said,

> I guess what was frustrating was that I was somewhat of a creative person in the group and people didn't support what I wanted to do. And I wish that somebody else would have like come out more you know, so that was frustrating. It matters that we had a good group and they just couldn't seem to care. I don't know what happened because I couldn't be there and so I figured they did not care.

The male student that took the leadership role appeared to consistently put down

virtually every idea that was brought up at the meeting and to impose his views

forcefully on the entire team. She also said:

> He ended up wanting be the one in control. And we never had conflict with him, we just felt a lot of the time that what he wanted to do is that, his way all the time. My teammates, they were ready to go home, and they just didn't care and I was really frustrated, so I couldn't do anything more about it.

When others were trying to contribute their ideas for the development of the product

and share their perceptions, the leader would disregard or criticize them. Sandy reflects

how she felt in this situation:

> Like yesterday, the fact that Rodney didn't want to leave the group because he felt like he was in control and he couldn't leave us on our own. That was like, I don't know, that was just frustrating cause we know, I think we all knew…our group was always really laid back about things and I almost wish there were more people, I don't know. I guess people do just kind of let things, like no one really wanted to argue, everyone had that kind of attitude that's like, we'll just let things be in somebody else's hands. If he wants to take control of them, we'll let him because no one really wants to. The type of personality to cause things and be upset about them and to just let things go the way they are. And I think that was kinda frustrating because no one really. I think it was hard cause I feel like the person, like I didn't want it to be that way, you know? I didn't want to be that kind of person. And I was going against other people going like well, we don't really care anymore.

Silence developed instead of lively conversation and soon the meeting was over before anyone could accomplish anything. Creativity, self-expression, engagement and participation were shut down. Sandy reflected in the focus group on what was missing in the interaction compared with other teams, which had lively interaction even if it meant facing and solving conflicts. She said,

I mean, there was not much struggle like we all worked together like we never fought or anything was a complete conflict where people these people just sat down, but it was like, when I had an idea about something it was just like "well, why don't we do this" instead of letting me do this. Like anytime that I like .. wanting to take the initiative to do something it was kind of like "oh, well I think I can do it better". And that was really frustrating. But I was like fine, if that's what you really want to do. I don't know maybe they didn't want to talk about their ideas and they didn't want to confront someone else about their ideas.

I kind of wanted to do more, creatively, I'm an art major too. And like, one of the other people in our group was really entertaining and stuff, and as much as I wanted to do stuff, I just kind of stepped back and let them take care of it, because I didn't want to argue over, I guess I'm just not that kind of person.

Task Management

The infrequency of the meetings struck me, as well as how lost the team appeared to be in accomplishing their tasks.. The team leader s had a conflict with the time of the additional help session conducted by the Teaching Assistant where the team leaders were supposed t to receive further clarification of the project tasks. Although the project required an especially strong effort of all the members of a team, this team did not appear to assign the project as high a priority as the other observed teams. Rodney, said:

My first concern wasn't this project, I was like it was there somewhere, but I was concerned about things outside of the group. I had a separate life, completely opposite of what is going on in here. I have a completely personal

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life that is going on outside of this and I just -- the engagement, we go there and if we have a problem that week, we take care of it, we divide the work and we leave. That is just routine, always like that.

Yeah, we weren't that comfortable yet to have conflict and we are still separate in a way. In a way that is kind of bad, everybody wants to get in as quick as possible and get out as quick as possible so they can get their work done as quick as possible. But at the same time they are not going to look twice, they might look at something twice but not three or four times to see if something is better or it could be done better. So it's good and bad thing, you are getting it done fast but you are not sure how well it's going to turn out. Like if we are forced to do something, you are not going to enjoy it as much as if it was just relaxed and out of choice.

I remember a meeting in the library that impressed me very much because, while most of the teams that I was observing had already gone through the whole process of developing their product and were finishing their documents, this team was appeared lost.

There was a lack of integration of the efforts of team members. There was a failure to assign and distribute tasks in several meetings. The team members appeared to not know what was going on or what they needed to be doing. Weeks went by without planning or accomplishing their tasks. One girl contacted a sponsor and nothing happened. They did not follow up on the visit. When ideas were presented in their meetings, they where not acknowledged or given serious attention. From the leader's point of view, it was either "my way or the highway". Pretty soon the team members were not contributing anything. The leader's view of the product as individual work instead of joint product is reflected in this comments from his interview:

I like, as far as leadership goes, I won't step up unless nobody else will, if nobody had stepped up I will do like in the beginning and try to initiate something. I like to make sure every angle is covered, like who is going to the next workshop, who got which assignment? I like to take the pressure off of the group. Like I wanted everybody's documents sent to me so I can figure out a way to put it together. As far as -- I came up with a lot of the brainstorming, I

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came up with the name, the acronym, the logo, the symbol, the cover page, a lot of like the brainstorming and the creativity was from me. Anything I can imagine, try to tell them, like when I told them the acronym everybody was like "wow" I stayed up 30 or 40 minutes trying to think of an acronym, it kind of just came like with the words I was thinking so I went online -- I actually spent a good 40 minutes thinking, but it just feels like I can call it mine. I came up with that name. And I like the individual part of it, the individual credit I can call this mine, this is my baby, this is my creation, you know, when people see my slide show, they are like "that's good", and I'm like "yeah, I like it".

A soft spoken, young, male student of the team could not stand up to the pressure of the leader who had an intense controlling and aggressive personality. The sense of ownership was not shared. For the team leader it was more a personal project than a team project. He later said:

> I like to be able to say, this is mine, not as in like the group but as in my individual work. Oh, it was my baby basically. I was holding it like wow, this is my cover, the next pages, my cover, I came up with the logo, the acronym, and in every page it's my acronym it say's "helping you talk to the world". And it's on every page and I was like "I came up with that" you know? It's my idea right there and on the front, it's my design, and the way that everything is like sliced up, looking all artsy, I was like "this is my product". And when somebody says "that cover looks cool" I'm like "I came up with that". But as far as group work goes, I don't like working in a group because I feel like if one person is slow, like these two guys, I would have rather not them showed up, because they just slowed us up.

The team spirit in this community was not developing as in most of the other teams I observed. The sense of the team leader's ownership of the product was blocking the common effort. In addition, he needed to defend himself from what seemed a personal attack.

> I took the initiative to e-mail everybody because I kind of sat and waited for somebody to do that and nobody did it, so I was like, somebody is going to have to do it. And it might as well be me, so I started with e-mailing everybody and asked them give me three days where you can meet and give me times when you can meet and I was going to pick out of those three days to get together with

everybody. So I found out that two of our guys said they were too busy and did not have time for anything and that kind of rubbed me the wrong way. We changed the time to meet their needs but it did not work. I thought "well we should be able to make it" and meet all the guys the first time, and basically all we did was come up with a company name and we came up with five products that we wanted to use and we didn't come up with the acronym it was just etc., we just came up with five products and the name and the other two guys didn't show up. They didn't contact me at all. Like after this they stopped contacting me, they said, we have work to do on Sunday, and I thought they were completely BS'ing me. We were supposed to submit the product we want to do, then we came up with the product name, and we turned that sheet without them coming to the meetings, and then we started to assign what people would do.

Some of the female students on the team were interested in doing their best in working with the leader, but one of them in particular could not get her point across. Still, she continued to try to work with the leader because she really cared about doing a good job on the project. She said in the focus group:

> Yeah, I think when we started together in the beginning doing everything, he wanted to make sure we started meeting on a regular basis and I think that he wanted us to be together. I didn't really think it was a negative aspect but it was kind of controlling at times that it was fine because we all gave an effort together so it wasn't that bad at the beginning.

> At the end when it came to the computer, he was not all that creative. He couldn't do everything but he still wanted to be in charge and do it all and that was when it became very frustrating because we had different ideas about how we wanted the things.

Her frustrations and sadness were evident to me at the end of the day when they built their booth and realized that other teams had accomplished much more than they had. A couple of days later, she shared in a focus group:

> The difference between our group and other groups was that I wish our group had been like yours. Like you're creative people and you handle it. But with our group, the creative people didn't really get an opportunity to really have the experience.

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Trust

This team experienced conflict in making all members of the team accountable for their work. As the team struggled to acquire a sense of community, the threats to their well-being were multiple and made the participants close down their personal feelings for their own protection. Trust did not develop. Doing a team project that requires intense interaction and requires a level of comfort, trust, and cohesion, if threats are present in their team space, these qualities to did not develop. The male team leader appeared to be unaware of the effect that his imposition on the choices had on the team. He said in his interview:

> There weren't too many conflicts, most of them were voting, choosing the product choosing the name, or since it was seven of us, it was like, oh, I like that, and if everybody liked that we went with the idea. Everybody just threw out ideas and nobody really clashed heads because everybody pretty much was accepting everybody's ideas. There weren't too many people inputting, there were just two or three people inputting and everybody else would just go out and do the work. Nobody got into conflicts, but if anything happened, usually the team voted on it, there was no dictatorship or anything, it was a democracy.

A few of the members ended up MIA - missing in action –a term used in the course for those that had not fulfilled their role in the team projects, and didn't even show up at the end. Others were just taking the course on a pass/fail basis, so they didn't care what came out of the project. The main interaction was between two to three members of the team who cared to do a good job.

The team did the best they could, but they could not negotiate. The leader was trying to make things work, but could not see the damage that resulted from being too controlling.

A team project like the one required in the course, required the strong efforts of everyone working in a democratic team. This was not achieved because of the behavior

of the project leader. The following is a description of how the leader interacted with the two members they dropped out of the team. He provides the following description of their interaction throughout time: He said:

> One night, I was on AIM (AOL Instant Messenger) and one of the MIA members actually cursed me out. He basically said "Hey, bitch every time you set up a time we are too tired or we are busy doing something" I actually have it saved on my computer because it automatically saves it, and he said "You have to quit that shit". That kind of rubbed me the wrong way and then he asked me what my name was, he didn't even know what my name was, he hadn't even visited the site. And I said, that's cool, because he said "hey, what's up" and he just like cursed at me, and that came out of nowhere. And right there I kind of shut him off, I was like, I have a like no mercy rule, you rub me the wrong way and it's not worth my time to argue with them. So he was like what's your name, and I was like "I gotta go" and I just didn't talk to them.

> About a week or two before they came to the meeting they cursed me and, they cursed me out about four or five weeks before that. I was pretty hostile. I was very friendly when they first showed up, I tried to explain to them what was going on. But at the same time I was like 'they are hopeless" I'm wasting my time trying to explain things to them, trying to give them a chance. Next time when they showed up they threw everybody off, Oh, yeah everybody was more tense, and uncomfortable. They were like "who are they?" and when we sat down, everybody sits down kind of in a square. But when they showed up it throws everything off and everybody kind of sits away from them, in a way, and then actually one person sat next to them, next to that guy and then the other guy, he sat on the floor away from everybody he never talked to everybody. That made everybody uncomfortable, everybody talked about that guy later like "he doesn't say anything, I don't think he knows what is going on".

> It wasn't frustrating in the beginning, it was like there are these two guys and they are not going to be involved, ok. It was frustrating when they came, and they wanted to be involved after all, and it's like, "we don't know you". And we are getting to the hard stuff now, the stuff that really counts and we don't know you and we can't trust you. You know, why are we going to put work on you? I rather just do it all by myself and you just get nothing. I set it up in the beginning with them to be there specifically and they took advantage of me I felt, of my time and of everybody else's time to be pushed back on their schedule and stuff like that. And I felt that was a big deal, like they were taking advantage of the situation here. And that was like strike 1, then he cursed me out and that was strike 2, and I was just waiting for the 3rd strike and then they show up and then don't show up afterwards and that was way like strike.

Then we met Sunday night to discuss exactly what we were going to do, which is like a couple of days ago, this past weekend. We decided in there what we wanted to get, things to get, how to get it, and who was going to get it. We actually went and did that stuff and Monday night we sat there building the booth, and then we came in today and set it up. And the funny thing about it is that after we were done setting it up today, everybody did their own little part. I brought in most of the electrical equipment, other people pitched in and got things like the sheets and ticker and the car, the little mini-car we had. Today, those two guys show up, they don't show up until the very end. And I was the only guy there, because the other guy left this morning and the girls that were there were really uncomfortable around them, they felt extremely uncomfortable. Like when they came, they walked away and talked to other groups and left me by myself in front of the booth and they come up and try to talk to me. They told me something about the ticker taker, I spelled like the schools name, needs to be spelled out and I spelled the cougars wrong. And I was like "ok, I'll fix it". But I wasn't about to let them inside the booth, you know, I treated them like an outside group, like "ok, this is this". And I didn't really care, I was just wondering why they were hanging around, I was like "they shouldn't even be here". And one of the girls felt so uncomfortable, and she thought she heard them say they were going to do something to our booth, so I was like "ok, I'll stick around until they leave". So, we made sure they left, and I stuck around until about 10 min. after to make sure nobody was around the booth. And I think they were badmouthing our booth and stuff like that just kind of ticks me off, rubs me the wrong way.

The leader was very much on guard and very willing to use physical force if necessary. For him, he was just doing what a leader does to protect the team. He was also not aware of the rules of the interaction between members of the team. What role did his aggression played in shutting down the contributions of others on the team? The tasks were not well planned, and the processes were not well managed because of the lack of communication and the lack of clarity about what needed to happen. At the end he said:

I wish I could go back and curse that guy out, I wish I could talk to him back and I really want to confront him when this is over and basically tell them, you know what you guys did… there is a reason why we did it a certain way, there is a reason why we stopped e-mailing y'all. We cut them off our e-mail server because we didn't want them to know what was going on. Because they didn't tell us what was going on, so why should we tell them what was going on. You

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know? If they want any information they will come to us and ask us, and they actually confronted the girls in class one day about the document and about what happened with the one that was sent the night before and the one that was sent the day before. And they told them, "oh we didn't get your document in and we just put yours on the back". and the guy was like "oh, my god, you didn't turn in my document". And they were like well you didn't get it in on time, it's not our fault. And they were just kind of upset, and yeah, that is why they were hanging around our booth today, trying to make us feel uncomfortable.

I don't see us hanging out after this, like we are done and that is it. If I see these people again it will be like hi, or what's going on? What classes are you taking? But it's not going to be like, "hey what are you doing? Well why don't you come and hang out with us?" that is not going to happen.

In this team the sense of community did not develop. Team members were not engaged with each other and barely interacted. An opportunity was lost for rewarding interaction and for learning with others.

Summary

This team illustrated negative social interaction and the damaging effect it had on the people involved. It illustrates the ways aggression and control by one member can negatively impact the performance of an entire team. Trust did not develop at all. They were not engaged nor did they enjoy each others' company. Team D met fewer times than the other three case study teams. Also the members of Team D struggled to accomplish the required tasks on time. At the end, their interaction was coming to a dangerous point of physical violence, when the two people MIA arrived so as to appear that they also participated in the project. At the end, their performance was poor. This team stands in contrast to Teams A and B, teams that created a psychologically safe learning space. Team D members were unable to come together to grow and develop. They remained disconnected from their tasks and barely managed to accomplish the

minimum elements of the project. Trust was not developed. They lived through the teamwork process, but they did not enjoy it.

From Team D, I clarified my understanding of teams in five ways:

1. Aggression and control by one member can negatively impact the performance of an entire team. The opportunity for growth is derailed and their small learning community cannot come together to become one.

2. Their sense of community does not develop, and they do not become an effective team. An aggressive leader impedes the efforts of the other team members and fails to create a broad sense of ownership of the project among all team members.

3. The result is that negative social interaction seriously impedes the creativity and the good will of team members resulting in a low quality product or performance. For those team members that truly cared, it was hard since they could not move out of the team dominated by a strong and aggressive individual.

4. Trust does not develop under conditions of aggression. A safe psychological space in which to interact and form a community where members can grow and develop their skills is not formed.

5. Participants do not engage or enjoy each others' company. Engagement with team tasks becomes disconnected and some teams barely manage to accomplish the minimum elements of their project.

Conclusion

In conclusion, scores obtained in the questionnaires were consistent with my observations of the dynamic team process and matched what participants reported to me in their own words. Based on the analysis of team scores and observations, I conclude that well integrated, united teams:

▪Create a safe and sound socio-psychological environment that enables participants to effectively engage in learning that integrates previously acquired knowledge from different courses with the new theoretical ideas and apply them to the development of an intellectual product.

▪Allow team members to engage in positive social interactions that lead to feeling respected and accepted, leading members to build trust and open sharing.

▪Facilitate trust and open and friendly communication that allows free expression of ideas and the negotiation of divergent views into compromises that help achieve the group's goals. Positive social interaction was intrinsically reinforcing and nurtured the commitment of members to each other, and to give their best to their team project common goals.

▪Demonstrate positive social interaction enabling monitoring of progress, mutual assistance and support and, shared task leadership as determined by expertise.

▪Demonstrate high levels of engagement that lead them to enjoy being actively involved with each other in their process of learning and achieving their goals at a higher level then they could do in their own.

In contrast to the above, it is also clear that learning in teams becomes difficult when any of the essential conditions of acceptance, trust, respect, positive social interaction, conflict management and mutual support are not present.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Chapter Overview

This chapter provides a brief summary of chapters one, two and three as well as the study's most important findings. It presents the conclusions and discusses the implications of the exploratory study for theory and practice. The limitations of this study are discussed and the needs for further research are identified.

Purpose of the Study

The purpose of this study was to examine the psychometric characteristics (validity, and reliability) of the Teamwork Assessment Scale and to examine its relationships with established constructs including Personal Characteristics of Instrumentality and Expressiveness and Team Performance in Team Flow and Team Synergy. The goal of the current study was to develop a psychometrically sound measure of Teamwork that would be used as an assessment tool in collaborative learning environments. The TAS was also used as a framework to examine the data collected from four descriptive cases studies to clarify the interpretation of the constructs, and advance our understanding of conditions that may enhance or impede the performance of learning teams in a an undergraduate higher education setting.

Problem Background, Theoretical Framework and Need for the Study

In order to advance what we know of teamwork in collaborative learning in higher education environments, it is important to develop a better understanding of the interaction and behaviors of teams engaged in collaborative learning activities. Collaboration involves the "mutual engagement of participants in a coordinated effort to solve the problem together" (Dillenbourg, Baker, Blaye, & O'Malley, 1996). Dillenbourg, and his colleagues (1996) have challenged the research community to build models that may help advance our understanding of learning in collaboration with others. They think the challenge is:

> "The challenge is to build a model for…how individual learning and verbal interaction interrelate… how dialogue is used as a means for carrying out joint problem solving and how engaging in various interactions may change the beliefs of the agents involved" (pg 207)

Learning constructively, particularly in the socio-constructivist paradigm (Vygotsky, 1978), requires an environment in which collaboration is situated in authentic activities and contexts. Active construction of meaning (Vygotsky, 1978) about experiences should take place through "experiential exercises followed by interpersonal interaction in small groups, and with facilitators to guide the group towards useful conclusions" (Romiszowski, 1997, p. 33). Positive social interaction is a condition for the social creation of knowledge (Brandon & Hollingshead; Verdejo, 1996). New tools, derived from our understanding of how people learn in social interaction, are needed to assist faculty and team members in the development of teamwork skills.

Together with the change in our views of learning, we also need to change the traditional test culture and adopt a formative assessment approach that is both reflective

and performance-oriented. New ways of teaching and learning encourage students to take responsibility for their own learning, at different phases in the instruction process (Sluijsmans & Moerkerke 1999), and to reflect on the process of learning with others. Also new ways of teaching and learning require new forms of assessment, whereby assessment and learning are tightly coupled. Opportunities for reflection are also an important but often neglected element in learning environments. Assessment procedures need not only serve the purpose of demonstrating student achievement, but may also help students reflect upon and monitor their progress and performance New views of monitoring classroom performance therefore require richer modes of instruction and new assessment practices in higher education.

Socioemotional processes underlie the building of group structures, leading to the establishment of a social space to support the work of the team. The realm of social interactions in learning environments, then, cannot be underestimated. Social interaction is not only important for the cognitive processes for learning, but is equally important for socioemotional processes such as affiliation, the development of social relationships, and the creation of a sense of cohesiveness and community (Harasim, 1991; Henri, 1992). These qualities are important in creating a sound social space, which is essential for reinforcing learning through social interaction. Sound social space (Kreijns et al., 2003) has been defined as

> the network of social relationships amongst the group members embedded in group structures of norms and values, rules and roles, beliefs and ideals…characterized by affective work relationships, strong group cohesiveness, trust, respect and belonging, satisfaction, and a strong sense of community. (p. 33)

A sound social space is important because it facilitates and reinforces positive social interaction, which, in turn, influences the effectiveness of collaborative learning.

Research has demonstrated that social Interaction encourages critical thinking (Garrison, Anderson, & Archer, 2000), facilitates shared understanding among group members (Clark & Brennan, 1991), aids the social construction of knowledge (Bednar, Cunningham, Duffy, & Perry, 1995; Glaserfeld, 1995; Jonassen, 1994; Palincsar, 1998), and supports the acquisition of competencies (Keen, 1992; Short, 1984).

Effective learning teams need to work effectively in accomplishing both individual and collaborative tasks. However, solely focusing on task orientation in collaborative learning activities may impede the development of social relationships and the creation of a sense of cohesiveness and community in learning teams (Harasim, 1991; Henri, 1992).

Socioemotional processes are at the base of group forming, the establishment of a normative and affective structure, and the emergence of group dynamics (Forsyth, 1990). Social interaction is also a critical component of situated learning as learners become involved in a *community of practice* (Owen, 2000).

Teamwork is increasingly recognized as an essential 21st Century Skill and one that is not emphasized in the traditional paradigm of teaching and learning. Teamwork for some students is easier than for others. The process of acquiring teamwork skills may be determined by students' personal characteristics and backgrounds. These personal antecedents of the learner and the characteristics of the learning environment may influence the level of engagement of the student in a team project. Ideally, each student will grow intellectually while working towards a team goal. The ideal is for students to become contributing members of a learning team and, in the process, help their team effectively accomplish the team goals and tasks.

When courses include objectives about students' capacity to work as part of a team in collaborative learning projects, it is often difficult for the instructor to

effectively monitor and assess the contributions and level of participation of individual members of a team. Tools are needed for the assessment of teamwork to assist students in improving their skills to work in teams. To address this need an instrument, the Teamwork Assessment Scale, was developed to facilitate the assessment of the participation, contributions and interactions of individual members of a learning team in accomplishing their learning goals and tasks.

TEAMWORK ASSESSMENT SCALE (TAS)

The Teamwork Assessment Scale (TAS) is an instrument composed of 28 items that describe:

1) interpersonal behaviors that communicate respect, acceptance and willingness to work together, required for positive group interaction.

2) team functioning skills and actions of leading, encouraging, sharing and helping others that result in the successful completion of team tasks.

3) interpersonal and positive communication skills and empathy that lead to getting to know and trust others, develop positive social interaction, and to effectively manage conflict. These qualities allow participants to engage in positive, constructive, satisfactory interaction. Trust behaviors are also important and are related to the attainment of the team's common goals necessary for successful achievement of task activities.

Teamwork was examined using the scores obtained in the TAS. The TAS was developed by De Hoyos & Resta (2002, 2004) for the purpose of this study to measure face-to-face teamwork. Originally, it was developed to assist students in online collaborative learning graduate courses, in assessing themselves and members of their team on the dimensions of task management and social interaction within the

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collaborative learning process. The TAS was developed for repeated use during the semester.

The TAS is has been adapted for this study to be used to measure face-to-face teamwork dimensions (See Appendix B). The purpose of this study was to examine the psychometric characteristics (validity, and reliability) of the TAS and explore its relationships with established constructs including Personal Characteristics of Instrumentality and Expressiveness and Team Performance in Team Flow and Team Synergy.

The study was designed to:

1) determine the constructs underlying the TAS by means of Factor Analysis

2) calculate the reliability of the scale

3) assess criterion-related validity of the TAS Factors by examining if theoretically consistent convergent relationships with related constructs of Personal Characteristics of Instrumentality and Expressiveness were found by means of correlations; discriminant validity was assessed by means of binary logistic regression with extreme groups formed by scores on Team Flow and Team Synergy.

4) examine criterion validity evidence for Task Management, Positive Social Interaction, and Trust factors and their joint contribution through path analyses of Positive Social Interaction, Trust and Task Management, as predictors of team performance as evidenced by perceptions of Team Flow and Team Synergy.

5) observe behaviors in selected teams to help clarify the interpretation of the constructs, and advance our understanding of the conditions and factors that lead to a learning team's performance.

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Methodology and Results Summary

The study, conducted in a field setting, was based on survey research, and longitudinal team observations, and included interviews and focus groups at the end of the project. The context for the study was a large undergraduate class in which students worked on collaborative learning teams in completing a major project. The setting was a large Southwestern public university. Participants in the course completed paper and pencil questionnaires and a sample of teams was observed during the semester to obtain descriptive information on their team processes.

This study used a cross-sectional sample that concurrently assessed the extent to which 1) Personal Characteristics of Expressiveness and Instrumentality 2) TAS factors of Social Interaction, Task Management and Trust, and 3) Team Performance as Team Flow and Team Synergy matched the proposed theoretical patterns.

Four case studies were examined throughout their teamwork experience.

DATA ANALYSIS RESULTS SUMMARY

Major questions and hypotheses

The study addressed the following four questions.

Research Question 1

What are the factors that underlay collaborative learning teamwork as measured by the TAS?

Major findings

The three factor solution was adopted as it seemed to best fit existing theoretical frameworks and give clarity to the dimensions measured. Factor 1 was labeled as Social Interaction, Factor 2 as Task Management and Factor 3 as Trust.

Social Interaction was defined as the interpersonal behaviors that communicate respect, acceptance and willingness to work together, required for positive team interaction.

Task Management was defined as the team functioning skills and actions of leading, encouraging, sharing and helping others that result in the successful completion of team tasks.

The Trust dimension measured interpersonal and communication skills that lead to getting to know and trust others, and managing conflict. Trust is defined as a positive team environment that leads members to accomplish tasks, freely share talents, resources, ideas, and discuss points of view and shortcomings.

A short version of the scale was created with 13 items that load above .4 as recommended by the Stevens criteria. A long version of the scale was used with the 28 items, including the items with lower loadings for the exploratory analyses of research questions 2-4.

Conclusion #1

TAS scale measures three factors: Social Interaction, Task Management and Trust.

Research Question 2

Does the TAS have Internal Consistency Reliability to measure face-to-face teamwork?

Major findings

Reliability coefficients are direct estimates of proportions of consistent score variation. The reliability and validity evidence from this study provided information about the usefulness of the TAS for the assessment of face-to-face teamwork.

Cronbach alpha reliability coefficients are considered an indication of high scale consistency. For the purpose of this analysis, the 28 items were used resulting in the following coefficients Alpha coefficients: Trust=.80, Social Interaction =.85, and Task Management = .87. A Cronbach Alpha Coefficient higher then .8 indicates high reliability and .7 is adequate reliability. The coefficients obtained for the long version of the TAS are deemed acceptable.

The TAS also has high correlations among the subscale scores. The Inter-Factor Correlations among the subscales for this sample of college students ranged from r. = .31 to .44 which are considered Low to Moderate. The correlation between the TAS factors Social Interaction and Task Management was r. = 0.31, between Social Interaction and Trust r. = 0.39 and between Task Management and Trust r. = .44.

Relatively low to moderate correlations were found among the subscales and relatively moderate to high correlations were found between the subscales and the total scale. For example, the correlations for Social Interaction went from .47 to .72, for Task Management from .38 to .60 and for Trust from .51 to .65. These results suggest that different yet related aspects of teamwork are assessed with the use of the scale.

The Item Total correlation in the Task Management factor suggests that the TAS scale may be strengthened by adding new items to assess shared leadership issues of

teamwork. The item correlations of the trust factor identify the importance of empathy and positive social interactions that facilitate the trust building process required for a team member to be able to openly share feelings with a team.

Conclusion #2:

The TAS is a reliable instrument with adequate levels of internal consistency in the three scales.

Research Question 3

What is the relationship between the TAS and the PAQ?

Major findings

Evidence for Convergent validity of the TAS, was found as the correlation between (a) Expressiveness and Social Interaction was higher then the correlation between (b) Instrumentality and Social Interaction. However a small but significant correlation was found between Instrumentality and Social Interaction ($r = 0.09$, at $p < 0.04$, 2-tailed). The size of the coefficient is much smaller supporting the TAS Social Interaction Factor Convergent and Discriminant validity.

In the analysis of the Task Management Factor, a significant correlation was found between Instrumentality and Task Management. The relationship was almost equal to the correlation found between Expressiveness and Task Management. The Instrumentality and Task Management correlation ($r. = 0.47$, significant at $p < 0.0001$, 2-tailed) provided support for the Convergent validity but the correlation between Expressiveness and Task Management was almost equal ($r. = 0.46$, significant at $p < 0.0001$, 2-tailed) when it is recommended that the divergent dimension be lower. To examine additional more in depth evidence on the issue of convergence and

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discrimination power of the TAS an additional Post-Hoc analysis was conducted through the creation of extreme groups in the other two variables in the Nomological network of the TAS, Team Flow and Team Synergy.

The assessment of Discriminant validity, a process of extreme groups' discrimination, was examined by means of binary logistic regression. Extreme groups' discrimination is recommended as a means to determine the power of a variable to discriminate group membership.

The results from the binary logistic regression analysis illustrate the power of the three factors to predict Team Flow and Team Synergy. Discriminant validity for Task Management, Social Interaction, and Trust was supported based on the ability of the scores to correctly predict the classification of extreme group membership with a high degree of accuracy. The significant relation indicates that the two factors scales of the TAS Task Management and PAQ Expressiveness are not measuring convergent aspects of personal characteristics and teamwork dimensions.

Conclusion #3

The correlations found were in support of all convergent hypothesized relationships. Divergent validity was supported for Social Interaction but was not supported for Task Management. Trust was related to both Expressiveness and Task Management.

Research Question 4

To what extent does Teamwork, as measured by TAS, predict Team Flow and Team Synergy?

Major Findings

The Social Interaction Model examined the relationships between the Teamwork components of Social Interaction, Task Management, and Trust with 1) Personal Characteristics antecedents of Instrumentality and Expressiveness and 2) Team Performance outcomes in Team Flow and Team Synergy. In relation to the Teamwork factors, it was found that the Personal Characteristics variables of Instrumentality and Expressiveness exert a positive influence and predict teamwork performance both directly and indirectly. Trust influences Social Interaction and both influence Task Management. Teamwork factors of Trust, Social Interaction and Task Management, predict Team Flow and Team Synergy.

Conclusion #4

Results of the path analyses indicated that the model of the relationships between personal characteristics and Teamwork was supported. The data collected in this study appeared to fit very well the Social Interaction Model as judged by the fit indices.

Although other models may have superior fit, I was interested in assessing the psychometric characteristics of the TAS and in testing the value of a specific theory that relates social Interaction to team members' personal characteristics and team Performance. The Social Interaction Model provided a good fit to the data. All relationships specified in Figure 1(pag. 10) were hypothesized to be positive, and the four theoretically based indirect effects hypothesized were found to be significant. The hypothesis that the proposed Social Interaction Model was plausible in the college student sample was supported. The overall indices of fit support the plausibility of the model in the sample data. Results of the path analyses indicated that the model of the

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relationships between Personal Characteristics and Teamwork was supported, providing for criterion validity evidence for the TAS. In addition the hypothesis that Teamwork and personal characteristics can predict Team Performance was also supported. A significant amount of the variance in teamwork was explained by the variables in the model. The amount of variance accounted for by Positive Social Interaction was 0.50, by Task Management was 0.52 and by Trust was 0.22. The amount of variance accounted for by Team Flow was 0.16 and Team Synergy accounted for 0.10.

In the case of Team Flow's and Team Synergy's R-Square, the amount of variance explained indicates that more variables are needed to account for the relationships found. The low amount indicates that some important relationships are missing in the model.

Results indicated that the initial model was plausible in the sample of college student teams. Findings from the path analysis provided evidence supporting the primacy of a safe and trusting positive social environment and its influences over the accomplishment of team learning tasks, and in predicting the engaged enjoyment in activities that challenge students to develop their skills and building synergy in teams.

Case Studies Conclusions

Observations of the process and dynamics of teams in four case studies helped clarify the interpretation of the constructs of the TAS, and contributed to our understanding of the conditions, processes and interactions in teams, that impact the performance of the team.

Conclusion #5:

In a powerful learning environment, created by a collaborative course design environment, essential conditions and factors that contribute to performance of cohesive learning teams include:

■A safe and sound socio-psychological environment is essential to allow team members to engage in positive social interactions, feel respected and accepted, and to build trust and open sharing.

■Trust facilitated open and friendly communication that allowed the expression of ideas and the negotiation of divergent views into compromises that benefited the goals and feeling of project ownership of team members.

■Positive social interaction nurtured the commitment of members to each other, and encouraged members to give their best to their team project common goals.

■Positive social interaction enabled monitoring of task progress and provision of mutual assistance and support with personal skill deficits and personal needs.

■Shared leadership of tasks, as determined by expertise, led to higher performance.

■A high level of engagement and enjoyment in being actively involved with each other in their process of learning was achieved when co-learners shared leadership, supported one another, effectively managed conflict, and were focused on the tasks to be accomplished.

Interpretation and Discussion

When I started this study, in addition to examining the psychometric characteristics of the TAS scale, developed as a tool for the assessment of teamwork, I had several other questions in mind: How can we get a group of team members to

engage in a collaborative process with positive social interactions and where the motivation is enhanced, and knowledge production results from the collaborative effort and the merging of perspectives? What conditions do you have to create in a learning environment so that students can experience a high degree of engagement and enjoyment? How can you help students acquire teamwork skills?

A true collaborative project requires the efforts of all team members. Using as a framework the Social Interaction Model developed for this study, I observed several teams through their process; listening to what they told me in interviews and focus groups, I found evidence that engaged learning takes place in learning communities when several conditions are met including:

■The sense of community develops over a foundation of acceptance and respect where each member is welcomed and appreciated. Commitment to group goals, cooperation among members, and satisfaction with group efforts requires that each member is treated as a valued member of the team.

■Accepting each other's differences creates a layer of respect and acceptance that produces a feeling of comfort in the team environment, and allows team members to be open with each other. Acceptance increases the flow of information and mutual support between all members.

■Positive feedback about the quality of individual work reinforces the feeling of being valued, affirmed and appreciated and provides individuals with renewed motivation to work and invest more effort in the team's projects and tasks.

■Shared leadership is a very important condition for team performance. A team project, like the one required in the course, required strong efforts of everyone working in the team.

■Trusting each other at the personal level leads to trustworthiness. In task trust, members of the team do not want to fail those that they feel close to and are part of their inner circle of interaction. There were two types pf trust: Personal Trust that allows for sharing of who I am, where I come from, what I feel, and what I am experiencing, and Task Trust that relates to meeting the individual commitments to contribute to the common task.

■Strong Task Management and Leadership are needed to succeed in a project. Positive Social Interaction is key for social learning, but positive social interaction is not enough for a team to succeed.

■A sound social space promotes positive feelings between team members such that learners experience a greater sense of well-being and recognize that they have a group of willing individuals to call on for support.

■When aggression is present, even if it is only in one member of the team, the opportunity for growth is impeded and makes it extremely difficult for the community of learners to come together as a whole. The sense of community does not develop under aggressive conditions. Aggression derived from frustration, turns team members off and, to protect themselves from harm, they may withdraw from close interaction... As a result, they become disengaged.

■Negative social interaction inhibits creativity and destroys the good will of team members, resulting in low quality team performance.

IMPLICATIONS FOR THEORY

This study contributed to the body of knowledge that addresses key issues that impact the performance of people working in teams. Collaboration involves the "mutual

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engagement of participants in a coordinated effort to solve the problem together" (Dillenbourg, Baker, Blaye, & O'Malley, 1996, pg 190).

Results of this study confirm the belief that social interaction is a key element of group learning to maintain mutual engagement of participants as indicated by Vygotsky's (1978) notion that social interaction is a condition sine qua non for group learning. Positive social interaction is a condition for the social creation of knowledge (Brandon & Hollingshead, 1999; Verdejo, 1996).

The Social Interaction Model tested in this study by means of path analysis, is consistent with social constructivist views of how learning takes place in social interaction.

Socio-emotional processes are at the basis of group formation, the establishment of a normative and affective structure, and the emergence of group dynamics (Forsyth, 1990). The study results are in accord with Kreijns, Kirschner & Jochems' (2003) view of social interaction as essential for members of a team to get to know each other, commit to social relationships, develop trust and develop a sense of belonging, in developing a learning community. In addition, their view of the need for a sound social space that reinforces and supports the social interaction, that is taking place among the team members, is also consistent with the results of the study.

The data used to test the Social Interaction Model and the team observations, supports both Forsyth's and Kreijns, Kirschner & Jochems' views on the importance of the social and affective interaction, in developing a learning community. Evidence in the statistical data analyses presents a slightly different view from Kreijns, Kirschner & Jochems as they assert that these processes are not directly related to the task in the strict sense (2003, p. 33). A significant direct effect of Trust and Social Interaction was found on Task Management. Also Trust was found to influence Task Management

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through Social Interaction indicating that Trust and the Social Interaction process are both directly and indirectly related to Task Management.

Path analysis to test the Social Interaction Model fit is in alignment with Johnson & Johnson's, views on Task and Social Interaction, reflecting the idea that if social interaction exists in both dimensions, collaborative learning will yield benefits by increasing participants' efforts to achieve, by promoting caring and committed relationships, and by increasing participants' psychological health and well-being (Johnson & Johnson, 1992, 1994).

Genuine collaboration is fundamentally predicated upon interpersonal "interaction" (Harasim, 1989), structured to achieve established goals (Johnson & Johnson, 2000), and "genuine interdependence" (Salomon, 1995) between group members in powerful learning environments. The fit of the Social Interaction Model agrees with Harasim, Johnson and Johnson, and Salomon.

Two personal characteristics that were explored in relation to teamwork are the constructs of Instrumentality and Expressiveness, based on earlier sociological concepts of Agency and Communion. Wiggins' conception (1991) of agency involves power, mastery, and assertion. Communion involves intimacy, union, and solidarity. Thus, Instrumentality behavior was described more in alignment with self-assertion and goal-orientation, and Expressiveness as the behaviors and the conditions needed to promote positive social interaction. Previous research had hypothesized the relationship between teamwork and Instrumentality and Expressiveness (Menchaca & Resta, 2002), and the data collected in this study, fit the model that tested the relationship between Instrumentality and Expressiveness as antecedents of Social Interaction, Trust and Task Management dimensions of teamwork.

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Study results, while providing a clearer understanding of Social Interaction, Trust, and Task Management factors, related to the effectiveness of teams working face-to -face in higher education settings, also highlighted the importance of new dimensions that need to be included in the assessment of teamwork. These include Personal and Task Trust, Shared Leadership, and Conflict Management. In order to explore these dimensions, new questions should be added in the next revision of the TAS.

RECOMMENDATIONS FOR FURTHER RESEARCH

Further research is needed to determine first, how teamwork capacities change over time when students are given the opportunity to work in collaborative learning teams. We need to study how we can cultivate the development of behaviors that are related to teamwork skills, and the extent to which each skill stems from Personal Characteristics like Instrumentality and Expressiveness, or gender and culture, as they can be very important to facilitate the teams' becoming an effective learning team with the characteristics of flow. In addition, it is important to understand how the conditions of a powerful learning environment influence the development of teamwork skills, and the productivity, and effectiveness of teams.

Second, focused research on the effects of self and peer-assessment on student's development of teamwork skills, and improvement of their performance would be a useful follow-up to this study.

Third, the TAS measure consisted of 28 items that explored three areas of teamwork performance: Task Management, Social Interaction and Trust. Items that differentiate Task Trust and Personal Trust need to be added and items related to Shared Leadership and Conflict management need to be included and explored, preferably through repeated measures.

Fourth, items that in the validation of the scale came up with low loadings need to be carefully examined in the light of team theory; the items need to be rewritten or deleted in the revised version of the scale.

IMPLICATIONS FOR PRACTICE

The relationships hypothesized and found in this study of the Social Interaction Model, can be of benefit to education and also to the world of work that increasingly requires people to wok in multidisciplinary and multicultural teams.

For education, the results of this study point toward the need and importance to develop tools to assist team members in their developing process of teamwork skills. Highly developed teamwork skills make for satisfactory and positive social interaction. Tools like the TAS may help instructors monitor progress of students and assist students in examining where they are in their skill development process.

The study results contribute to a better understanding of how to facilitate and assist the teamwork process in order to provide a rich academic experience that fully engages students working in teams to achieve flow. The TAS was found to be a valid measure that can be used in collaborative learning settings. The three factors comprising the TAS: Task Management, Social Interaction and Trust, will help identify the extent to which effective collaborative learning teamwork is taking place in a team and interventions can now be implemented to assist students struggling to learn to work in teams.

The TAS may help faculty to monitor and facilitate students' progress and provide early detection of problems encountered by individual team members or teams. In addition, the understanding of students' needs, derived from their personal

characteristics, will help design interventions that can deliver individualized assistance to students and facilitation to teams according to the characteristics of their members.

LIMITATION OF INTERPRETATIONS

This study was exploratory in nature and based on survey data, team observations and interviews, given that the primary purpose of the study was to examine the psychometric characteristics of the TAS. The survey data's validity may be threatened by the number of students who did not volunteer to answer the questionnaires, but this threat was reduced based on the very high participation rate obtained. Teamwork is a process and the study was cross-sectional; as there was only one measurement point for the questionnaires. Repeated measures may provide information on the stability of the TAS assessment over time, and it also may reflect how the dimensions of teamwork may change over time.

This study used a convenience sample and consequently, the potential generalization of the study to other settings implementing collaborative learning in higher education may be constrained. It remains to be examined if similar results are obtained with another sample, or with other surveys conducted periodically, or in other courses in other campuses.

For the protection of the participants, the identity of the teams participating in the study was kept confidential and not disclosed to the instructor or teaching assistants. during the project. Students interacted with the Instructor and Teaching Assistants and received direct support and coaching in their project as needed. The opportunity to observe the impact of the interventions by the instructor and teaching assistants was not possible based on the requirement for non-disclosure of team participating in the study. Students agreed to warn the researcher when the instructor or assistants were going to

be present in a team meeting to protect the privacy of their participation. It was difficult to hide from the instructor as teams met in public places in campus and the instructor and the teaching assistants' team were often going from one team meeting to another.

This type of cross-sectional descriptive study based on survey research, and longitudinal team observations, with interviews and focus groups at the end of the project, has the following validity treats: history, maturation, instrumentation, mortality and the following external validity treats: Participant representativeness, testing-treatment interaction, selections-treatment interference, specificity of the variables, experimenter effects, and reactive arrangements. These sources of invalidity were discussed in detail in Chapter 3.

The observation part of the study has threats of testing, and instrumentation that result from the reactions of participants to the effects derived from instrumentation and the researcher. As mentioned above, although a convenience sample was used, the population of the study had a broad university-wide representation that may be similar to those of other similar university settings and undergraduate learning environments. Further research is needed to determine whether similar findings are found in other similar higher education setting..

Two additional areas of limitations must be considered when drawing conclusions from this study, and these areas help provide ideas for future research. First, all measures were based on student self reports. Constructs such as perceptions of Social Interaction, Task Management and Trust may appear quite different if reported by peer-assessment and by faculty member's observations, by Teaching Assistants, or by online student's individual mentors. In addition, with respect to the TAS measure, students view of themselves and their assessment of their team performance may change as a result of living the process and receiving feedback on their performance.

Summary

The TAS showed promise in the quest to develop tools that can assist team members in their collaborative process. The purpose of this study was to examine the psychometric characteristics (validity, and reliability) of the TAS and examine its relationships with established constructs such as Personal Characteristics of Instrumentality and Expressiveness and Team Performance in Team Flow and Team Synergy.

This study provided the opportunity to examine teamwork processes and dynamics in a uniquely powerful learning environment, where teams participated in a highly challenging project. The team project required the use of multiple and high level skills that could only be achieved to high standards, if the team members were mutually engaged in collaboration, were intensely involved in their team activities, and experienced shared knowledge building. The learning environment of the course created a context for students to experience Team Flow and Team Synergy.

Evidence of the convergent and discriminant validity of Task Management, Social Interaction, and Trust constructs was revealed by the ability of the factors to predict membership in the low-engaged teams and the high-engaged teams group

In addition to the power of the factor scores to correctly classify highly successful or failing members of extreme groups, theoretically consistent relationships with related constructs of Personality Characteristics of Instrumentality and Expressiveness were found by path analyses that tested a nomological network between the concepts. Additional evidence for the criterion validity of the Task Management and Social Interaction constructs was found using the TAS factors to predict Team Performance measured by self-assessment Team Flow and Team Synergy.

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One correlation was found to be higher then expected, the relationship between Expressiveness and Task Management, but the coefficient was still lower than the expected relationship with Instrumentality. This finding raises interesting questions about the relationship of Expressiveness to Task Management that will need to be explored further in future research.

Faculty using teams in their courses confront the need to assist team members to be effective contributors to the team goal. A better understanding of what students bring to the teamwork process and the needs they have for the development of their teamwork skills may help instructors provide appropriate team facilitation and monitoring of student skills development during a course. The TAS is a tool that has the potential to assist students and instructors in the development of assessment skills, important for the new views of learning and assessment.

We need to continue to study and better understand the process of learning to work in teams at the college level so that students reach the world of work with highly developed teamwork skills, particularly the skill of self-reflection and the skill of providing feedback to peers. Social skills encompass the ability to see with positive regard the uniqueness of teammates; the ability to be kind, warm, and also, the ability to trust and share information about yourself, your story, your points of view, your resources and skills in order to help others. It is also important to negotiate and communicate your needs and be willing to receive help on your shortcomings. All these social skills provide an environment where the team comes together to have fun and enjoy each other's company in the process of learning together in small communities.

The present study has focused on an area of growing importance in understanding changing practices in higher education and the new tools required to support such practices. This exploratory study raises a number of important questions

which, hopefully, will guide future research focused on developing a better understanding of teamwork in higher education settings.

APPENDICES

Appendix A
Instructions, Consent Form, and Personal Attributes Questionnaire

Assessment of Teamwork in Higher Education Collaborative Learning Teams:
A Validation Study

Research Study Instructions & Important notes:
1) Sign and date the **Consent** to participate in the teamwork research study.
Keep the student copy for your files.
2) On your green Scantron answer sheet, make heavy black marks that fill the circle completely with your pencil.
3) In the space for name, bubble the initials of your **College** as they appear in the following list:

School of Architecture	**ARC**	College of Natural Sciences	**CNS**
LBJ School of Public Affairs	**LBJ**	Developmental Studies	
DEVS			
McCombs School of Business	**CBA**	School of Information	**SINF**
College of Communication	**COM**	School of Law	**LAW**
College of Education	**COE**	School of Nursing	**SNU**
College of Engineering	**ENG**	School of Pharmacy	**SPH**
College of Fine Arts	**CFA**	School of Social Work	**SSW**
College of Liberal Arts	**CLA**	Intercollegial Programs	**ICP**

4) In the space for **Gender** bubble in M for male or F for female
5) In the space for **Grade or Education**, if you are classified as
    Freshman, bubble in 13
    Sophomore bubble in 14
    Junior bubble in 15
    Senior bubble in 16
6) **Birthday**: bubble in Month, Day and Year.
7) Identification Number: Under the columns ABC, bubble your 3 digit **Team numbers**.
8) Under Special Codes Column K, for **Type of Team** bubble in,
1. Team members were self-selected
2. Team members were Randomly Assigned
9) Under Special Codes Column L, for **Culture** of origin, bubble in
1. American
2. African American
3. Hispanic
4. Asian
5. Native American
6. Other

Assessment of Teamwork in Higher Education Collaborative Learning Teams: A Validation Study

Informed Consent to Participate in Research
The University of Texas at Austin

You are invited to participate in a research study. This form provides you with information about the study. The Principal Investigator, Marylu Menchaca is a doctoral candidate at the University of Texas at Austin working on her doctoral degree in the Instructional Technology Program of the Curriculum and Instruction Department. The purpose of this study is to develop, and validate teamwork assessment tools useful in collaborative learning environments, and to explore their relation to student perceptions of personal characteristics and engagement in their team activities.

You are asked to participate because, as a student of the University of Texas at Austin, you are currently engaged in the teamwork process. The following is provided to help you decide whether to take part and if there is anything you do not understand, you can ask me questions about the study by e-mail to Marylu_Menchaca@teachnet.edb.utexas.edu or you may contact the dissertation Chair Paul Resta: resta@mail.utexas.edu or call (512) 471-4014.

Your participation is voluntary and you do not have to answer every question on the questionnaires. You can refuse to participate without penalty to your course grades to which you are otherwise entitled.

I have been informed about this study's purpose, procedures, possible benefits and risks, and I have received a copy of this Form. I have been given the opportunity to ask questions before deciding to participate, and I have been told that I can ask other questions at any time. I voluntarily agree to participate in this study and by signing this form, I am not waiving any of my legal rights. I may decide to discontinue my participation at any time.

Signature of Principal Investigator   Date

Signature of Participant   Date

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Personal Attributes Questionnaire

(Short Form)

The items below inquire about what kind of a person you think you are.
Each item consists of a word or phrase that describes a characteristic with the letters A-E.
The letters A….B….C….D….E form a scale between the two extremes of **Never true of me A**, and **Always true of me E**. You are to choose a letter, which describes where *you* fall on the scale and with your pencil mark the circle that corresponds in the answer sheet.

For example, if you think you have no artistic ability, you might choose A. If you think you are pretty good, you might choose D. If you think you are only medium, you might choose C, and so forth. For example:

Artistic   Never true of me A….B….C….D….E Always true of me.

Please select a letter to rate the extent to which each word or phrase describe what you think of yourself.

1. Active	Never true of me A….B….C….D….E Always true of me
2. Independent	Never true of me A….B….C….D….E Always true of me
3. Emotional	Never true of me A….B….C….D….E Always true of me
4. Dominant	Never true of me A….B….C….D….E Always true of me
5. Excitable in a major crisis	Never true of me A….B….C….D….E Always true of me
6. Aggressive	Never true of me A….B….C….D….E Always true of me
7. Able to devote self completely to others	Never true of me A….B….C….D….E Always true of me
8. Gentle	Never true of me A….B….C….D….E Always true of me
9. Helpful to others	Never true of me A….B….C….D….E Always true of me
10. Competitive	Never true of me A….B….C….D….E Always true of me
11. Knows ways of world	Never true of me A….B….C….D….E Always true of me
12. Kind	Never true of me A….B….C….D….E Always true of me
13. Needs others' approval	Never true of me A….B….C….D….E Always true of me
14. Feelings easily hurt	Never true of me A….B….C….D….E Always true of me
15. Aware of feelings of others	Never true of me A….B….C….D….E Always true of me
16. Can make decisions easily	Never true of me A….B….C….D….E Always true of me
17. Never gives up easily	Never true of me A….B….C….D….E Always true of me
18. Cries easily	Never true of me A….B….C….D….E Always true of me
19. Self-confident	Never true of me A….B….C….D….E Always true of me
20. Feels superior	Never true of me A….B….C….D….E Always true of me
21. Understanding of others	Never true of me A….B….C….D….E Always true of me
22. Warm in relations with others	Never true of me A….B….C….D….E Always true of me
23. Need for security	Never true of me A….B….C….D….E Always true of me
24. Stands up well under pressure	Never true of me A….B….C….D….E Always true of me

Appendix B
Teamwork Assessment Scale (TAS)

Please select one answer and with your pencil fill out the circle that corresponds to your answer in the scantron sheet.

The items below inquire about your present teamwork experience. Each item consists of a phrase that describes a different aspect of the experience of working in a team. For each question, identify the statement that best describes your perception of how you participate in your team.

The letters A….B….C….D….E represent a 5-point scale between the two extremes of **Never A**, to **Always E**. You are to choose a letter, which describes where *you* fall on the scale. For each item, select the option you believe best reflects your personal efforts and contributions to your team.

Select **A** for **Never**   Select **B** for **Seldom**   Select **C** for **Sometimes**
Select **D** for **Frequently**   Select **E** for **Always**

25. I take an active role on initiating ideas or actions.   Never A   B   C   D   E Always
26. I am willing to take on task responsibilities.   Never A   B   C   D   E Always
27. I am willing to frequently share ideas.   Never A   B   C   D   E Always
28. I am willing to frequently share resources.   Never A   B   C   D   E Always
29. I Accept responsibilities for tasks determined by my group.   Never A   B   C   D   E Always
30. I help to promote team sense of community.   Never A   B   C   D   E Always
31. I respect differences of opinions.   Never A   B   C   D   E Always
32. I respect differences of backgrounds.   Never A   B   C   D   E Always
33. I am willing to negotiate and make compromises.   Never A   B   C   D   E Always
34. I provide leadership whenever necessary.   Never A   B   C   D   E Always
35. I provide support whenever necessary.   Never A   B   C   D   E Always
36. I acknowledge other members' good work.   Never A   B   C   D   E Always
37. I provide positive feedback.   Never A   B   C   D   E Always
38. I am willing to work with others for our group success.   Never A   B   C   D   E Always
39. I communicate in friendly tone.   Never A   B   C   D   E Always
40. I keep in close contact with the rest of the team
    so that everyone knows how things are going.   Never A   B   C   D   E Always
41. I produce high quality work.   Never A   B   C   D   E Always
42. I meet team's deadlines.   Never A   B   C   D   E Always
43. I am sensitive to the needs of team members.   Never A   B   C   D   E Always
44. I am sensitive to the feelings of team members.   Never A   B   C   D   E Always
45. I understand problems of team members.   Never A   B   C   D   E Always
46. I contribute possible solutions to problems of team members.   Never A   B   C   D   E Always
47. I openly share my needs with team members.   Never A   B   C   D   E Always
48. I openly share my feelings with team members.   Never A   B   C   D   E Always
49. I promote a positive team environment   Never A   B   C   D   E Always
50. I establish positive dialog to resolve team conflicts.   Never A   B   C   D   E Always
51. I monitor team progress toward tasks deadlines.   Never A   B   C   D   E Always
52. I am flexible to adapt to team needs.   Never A   B   C   D   E Always

Appendix C
Team Building Team Flow and Synergy

Please remember to enter your responses in the answer sheet.

53. Teams experience different stages in their team building process. Please select the stage that you think your team is in at the present time **(choose one).**
- A. Forming - orientation, introductions, agreeing on initial goals for the group
- B. Storming - dealing with differences of opinion and conflicts
- C. Norming - resolving difficulties and focusing on the work at hand
- D. Performing - functioning as a team, working together on a group project
- E. Adjourning- finishing with a group project and reflecting on the experience

54. In learning situations, we find several different types of groups.
Please indicate the description that you think best fits your team at the present time **(choose one)**.
- A. I am not a member of a team at the present time.
- B. Pseudo groups - members assigned to work together but they have no interest in doing so.
- C. Traditional groups - members agree to work together but see little benefit from doing so.
- D. Cooperative groups - members commit themselves to common purposes of maximizing their own and the group's success.
- E. High-performance cooperative groups - same as cooperative groups except that high-performance cooperative groups exceed expectations, given their membership.

Please rate the items in the following list to describe your teamwork experience at the present time.

Select **A** for **Never**
Select **B** for **Seldom**
Select **C** for **Sometimes**
Select **D** for **Frequently**
Select **E** for **Always**

53. We have fun working together.	Never	A	B	C	D	E Always
54. We sometimes lose track of time when we are working together.	Never	A	B	C	D	E Always
55. We enjoy talking to each other online.	Never	A	B	C	D	E Always
56. We enjoy talking to each when we meet face-to-face.	Never	A	B	C	D	E Always
57. We would like to continue working together in other projects.	Never	A	B	C	D	E Always
58. We are making good progress on our project together.	Never	A	B	C	D	E Always
59. When we are working together, I am completely immersed in the experience.	Never	A	B	C	D	E Always
60. I do not want to stop when a group session is going well.	Never	A	B	C	D	E Always
61. We can achieve more together than we could if we were just working alone as individuals.	Never	A	B	C	D	E Always
62. When we work together, we come up with really good ideas.	Never	A	B	C	D	E Always
63. When we work together, our ideas emerge quickly and easily.	Never	A	B	C	D	E Always
64. When we work together, our individual ideas become synchronized and merge into one really good idea.	Never	A	B	C	D	E Always
65. We use what each knows best to reach our goal.	Never	A	B	C	D	E Always
66. We help each other to achieve a shared understanding.	Never	A	B	C	D	E Always
67. We teach each other.	Never	A	B	C	D	E Always

68. Would you be willing to allow me to visit your group to observe your teamwork?

A) You can come to our meetings. (If you select this option, please sign in when you return the questionnaire)
B) I want our meetings to be private.

69. After the business fair, would you be willing to participate in a Focus Group about the experience of working in teams?
    A) Yes, I would like to participate in a focus group with members of different teams.
    B) Yes, I would like to participate in a focus group with members of my own team.
    C) No, I do not wish to participate
(If you select option A or B, please sign in when you return the questionnaire)
For the next questions, please answer in the space provided.
70. My best day and time to participate in a focus group is:

71. What do you like best about your experience in working with your team so far?

72. What would you like to do differently next time you work with a team?

THANK YOU VERY MUCH FOR YOUR PARTICIPATION. Marylu Menchaca

Appendix D
Interview Schedule and Questions

**Assessment of Teamwork in Higher Education Collaborative Learning Teams:
A Validation Study**

I have been informed about this study's purpose, procedures, possible benefits and risks, and I have received a copy of this Form. I have been given the opportunity to ask questions before deciding to participate, and I have been told that I can ask other questions at any time. I voluntarily agree to participate in this study and by signing this form, I am not waiving any of my legal rights. I may decide to discontinue my participation at any time.

Signature of Principal Investigator   Date

Signature of Participant   Date

Please sign below if you are willing to allow us to use sections of the tape of your teamwork experience description for scientific conferences or classroom use.
I hereby give permission for the video (audio) tape made of the interview for this research study to be also used for educational purposes.
Signature of Participant   Date

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Interview Questions

The conversation will explore your perception of the performance of your team.

1. Can you describe the process of how your team accomplished tasks throughout the project?
For example, tell me about:
      How did you organize the activity?
      How did assign responsibilities?
      Did your teammates accomplish on time what they were supposed to contribute?

2. How can you describe your team interaction to develop and maintain social relationships among your community?
For example, tell me about:
      How the group environment felt when you were working together?
      How did you feel about your conversations during the meetings?
      Do you feel that your team members developed trust with each other?
      Did friendships emerge from the team associations?

3. How did your team resolved conflicts that came up?

4. Are you satisfied with the product that resulted from the team efforts?

5. What would you do differently the next time you work in a team?

Appendix E
Focus Groups Schedule and Questions

**Assessment of Teamwork in Higher Education Collaborative Learning Teams:
A Validation Study**

I have been informed about this study's purpose, procedures, possible benefits and risks, and I have received a copy of this Form. I have been given the opportunity to ask questions before deciding to participate, and I have been told that I can ask other questions at any time. I voluntarily agree to participate in this study and by signing this form, I am not waiving any of my legal rights. I may decide to discontinue my participation at any time.

Signature of Principal Investigator   Date

Signature of Participant   Date

Please sign below if you are willing to allow us to use sections of the tape of your teamwork experience description for scientific conferences or classroom use.
I hereby give permission for the video (audio) tape made of the focus group for this research study to be also used for educational purposes.
Signature of Participant   Date

Teamwork Focus Group Questions

The purpose of the following questions is engage in conversation that will help us to clarify the interpretation of quantitative data collected during the course.

1. Tell us about your experience working in a team?

A. Effectiveness
    1. Did you have an effective team?
    2. What could have made the team more effective?

B. Tasks
    1. How close your team followed your planed task calendar for your project
    2. Can you describe the process of how your team accomplished tasks throughout the project?
    3. What problems did the team experience?
    4. How can problems be prevented?
    5. Did you have non-contributing members in your team?
    6. How did you deal with non-contributing members?
    7. What roles helped the achievements of your team goals?

C. Social Interaction
    1. How the group environment felt when you were working together?
    2. How did you feel about your conversations during the meetings?
    3. Do you feel that your team members developed trust with each other?
    4. Did friendships emerge from the team associations?
    5. What needs did you have in each stage of the team development process?

D. Conflicts
    1. Did your team experience conflicts?
    2. How did the team address and or solve the conflicts you confronted?

2. Did you achieve the experience of flow during your teamwork?
    1. How did you experience flow?
    2. What conditions facilitated flow?

3. What did you learn from the experience of self-assessment of your teamwork?

4. Did working in a team help you to learn the course content?

5. How can we help other teams to have a successful teamwork experience?

Appendix F
Descriptive Statistics.

Table 25: Kurtosis and Skewness

	Social Interaction	Task Management	Trust	Engagement	Synergy
Kurtosis	-0.308478397	-0.282119272	0.041317	0.19581532	0.47714
Std error Kurtosis	0.218656583	0.218656583	0.218657	0.2190935	0.21931
ratio	-1.410789434	-1.290239098	0.188958	0.89375233	2.17562
Skewness	-0.423733528	-0.201342049	-0.17286	-0.17204535	-0.479
Std error Skewness	0.109544956	0.109544956	0.109545	0.10976471	0.10988
ratio	-3.868124498	-1.837985579	-1.57799	-1.56740132	-4.3595

Appendix G
Long Scale Exploratory Factor Analysis Results

For the long version of the TAS scale, the 3 factor solution was adopted as it seem to make better theoretical sense and clarity in the dimensions measured. Factor 1 was baptized as Social Interaction, Factor 2 as Task Management and Factor 3 as Trust. We will review next the factor loadings and the items that constitute each dimension of TAS.

Factor 1 Social Interaction Long Version

Social Interaction was defined as the interpersonal behaviors that communicate respect, acceptance and willingness to work together, required for positive group interaction and operationalized by the items in the following Table xxx. That includes Factor 1 Social Interaction items loadings matrix for the 3 factors.

The three Factors solution revealed that on Factor 1, there were two items that did not load higher than .40 as recommended by the Stevens (1992) criteria, and 4 items in factor 2. Other view on factor loadings comes from Preacher & MacCallum (2003). Preacher & MacCallum remind us that factor loadings will vary due to sampling error and it is unreasonable to assume that loadings that are high in a single sample are correspondingly high in other samples or in the population (p.27). Therefore, they point out that there is no reasonable basis for reporting only those sample loadings that lie beyond a certain threshold when there is no logical basis for following such rules of thumb.

Preacher & MacCallum (2003) recommend to researchers trying to establish the relationships of the latent factors to the observed variables, that no absolute cutoff point

should be defined and to be interested in the complete pattern of loadings, including low loadings and mid-range loadings, not simply the ones arbitrarily defined as large because they were above 0.7. Moreover, depending on the field of study, large may mean around 0.3 or 0.4.

As it is unreasonable to assume that loadings that are high in a single sample of College students are correspondingly high in other samples or in the population, Preacher & MacCallum recommended approach will be used for the following description of some of the factor loadings.

Item loading on each of the three factors appear in the following tables. Further examination of the Social Interaction dimension loadings revealed that the item *I acknowledge other members' good work,* shared a .24 loading with item 2 and .11 loading with factor 3. Still the difference in the loading was greater then .04 tilting the decision toward keeping the items in the scale given that the content of the TAS 12 item measures an important aspect of teamwork. The item needs to be kept in close observation in the following studies. More items may be added to the communication of positive regard of member contributions in future revision of the TAS given that positive feedback contributes significantly to the motivation to excel in task performance.

The content of the TAS item 13: I provide positive feedback, also got a similar distribution in the factor loadings. Item 13 shared a .19 loading with factor 2 Task Management and a higher loading of .24 with the Trust factor.

In both items the positive feedback content address interaction issues that impact both the quality of the team relationship, the progress made in the task accomplishment and the development of trust based in the confirmation of the belief of been seen with positive regard as a valuable and contributing member of the team.

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Table 26: Factor 1 Social Interaction Items Long Scale Factor Loadings

Items Number Text and Factor loadings	Factor		
	1	2	3
7. I respect differences of opinions.	**0.70**	-0.06	-0.03
9. I am willing to negotiate and make compromises.	**0.68**	-0.05	0.02
8. I respect differences of backgrounds.	**0.67**	-0.03	-0.11
15. I communicate in friendly tone.	**0.59**	-0.05	0.02
20. I am sensitive to the feelings of team members.	**0.57**	-0.13	0.34
14. I am willing to work with others for our group success.	**0.48**	0.16	0.02
28. I am flexible to adapt to team needs.	**0.45**	0.21	-0.04
19. I am sensitive to the needs of team members.	**0.42**	0.02	0.37
21. I understand problems of team members.	**0.41**	-0.06	0.40
12. I acknowledge other members' good work.	**0.37**	0.24	0.10
13. I provide positive feedback.	**0.30**	0.19	0.24

Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization.
a Rotation converged in 5 iterations.

We will review factor 2 next.

Factor 2 Task Management Long Version

Task Management was defined as the team functioning skills and actions of leading, encouraging, sharing and helping others that result in the successful completion of team tasks. Task management items and factor loading appear next in Table 27.

In the factor Task Management 4 items had factor loadings less the .4. The item I keep in close contact with the rest of the team so that everyone knows how things are going shared a .21 loading with the Trust factor pointing toward the open and close communication process that promotes the fluid exchange of information and prompt remediation of the direction of efforts. The item I provide support whenever necessary share a .30 loading with Social Interaction speaking of the close relationship existing in teams that put to use the best of their abilities and allow others to come and provide timely help and assistance where and when is needed. The item I meet team's deadlines address the accountability aspect of the team interaction, it shared a .14 load

with Social Interaction. When a member does not meet team's deadlines the social interaction suffers. In the item I help to promote team sense of community the loadings were shared with Trust .24 and Social interaction .17. For a team to achieve a product that is the result of the merging of the minds, multiple conditions need to exist. We start with acceptance and respect and openness that build trust.

Table 27: Factor 2 Task Management Items Long Scale Factor Loadings

Items Number Text and Factor Loadings	Factor		
	1	2	3
2. I am willing to take on task responsibilities.	0.05	**0.66**	0.18
1. I take an active role on initiating ideas or actions.	-0.30	**0.63**	0.16
10. I provide leadership whenever necessary.	-0.13	**0.60**	0.13
3. I am willing to frequently share ideas.	-0.04	**0.60**	0.08
5. I Accept responsibilities for tasks determined by my group.	0.31	**0.52**	-0.20
27. I monitor team progress toward tasks deadlines.	0.11	**0.50**	0.14
17. I produce high quality work.	0.04	**0.48**	-0.01
4. I am willing to frequently share resources.	0.28	**0.45**	-0.07
16. I keep in close contact with the rest of the team so that everyone knows how things are going.	0.07	**0.37**	0.22
11. I provide support whenever necessary.	0.29	**0.35**	0.10
18. I meet team's deadlines.	0.14	**0.31**	0.05
6. I help to promote team sense of community.	0.17	**0.30**	0.24

Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization.
a Rotation converged in 5 iterations.

We will now review the factor loadings of factor 3 Trust.

Factor 3 Trust Items Long Version

The *Trust* dimension measuring interpersonal and communication skills that lead to getting to know and trust others, and interact and manage conflict.

The loadings of the two items related to sharing needs and feelings point to the principal content of the dimension where in order for a team to perform effectively a safe psychological space needs to exist where personal sharing can occur. Teams

experience conflict that requires a solid ground of positive regard and goodwill to engage in the team in the problem solving mode. Teams that ignore and do not address conflicts do not reach the higher performing stages. Trust is damaged and affects the task management deteriorating the team environment. The share loading of the item *I establish positive dialog to resolve team conflicts* of .22 with the Task Management Factor reflects reflect the joint contribution that positive communication makes to the building of team trust and to the successful completion of tasks.

The item *I promote a positive team environment* shares a load of .20 with Task Management and of .15 with Social Interaction connecting the actions to maintain a positive, psychologically safe teamwork environment with the Team tasks where members of teams interact in a positive social interaction facilitating the accomplishment of tasks.

Table 28: Factor 3 Trust Items Long Scale Factor Loadings

Items Number Text and Factor Loadings	Factor		
	1	2	3
24. I openly share my feelings with team members	0.07	-0.08	**0.74**
23. I openly share my needs with team members	-0.10	-0.08	**0.73**
22. I contribute possible solutions to problems of team members.	0.04	0.14	**0.49**
26. I establish positive dialog to resolve team conflicts.	0.00	0.22	**0.48**
25. I promote a positive team environment.	0.15	0.20	**0.43**

Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization.
a Rotation converged in 5 iterations.

In the TAS scores, low scores of 1 represent low Trust Building behavior, low presence of Positive Social Interaction and Poor Task Management; scores of 5 represent higher amounts of Trust Building behavior, Positive Social Interaction and Task Management. From the scores of the individual questions in a dimension, a mean score was calculated.

Summary

Research question 1 was addressed via exploratory factor analysis (EFA) using the SAS program (SAS, 2003), and the study established that the Social Interaction and Task Management factors previously found in Online Collaborative Learning teams were present in this sample of face to face Collaborative Learning teams. The factors were appropriate to explore the hypothesized relationships of the Social Interaction Teamwork Model and the scale added a new factor named Trust. Trust is defined as a positive team environment that leads members to accomplish tasks, freely share talents, resources, ideas, and discuss points of view and shortcomings.

Social Interaction is defined as the interpersonal behaviors required for positive group interaction. Task Management is defined as the actions that result in the successful completion of team tasks. Trust is defined as a positive team environment that leads members to accomplish tasks, freely share talents, resources, ideas, and discuss points of view and shortcomings.

Appendix H
Additional Data Analyses

Personal Characteristics, Teamwork and Team Performance

The primary purpose of question 4 was to examine if Team Performance reflected in Team Flow and Team Synergy can be predicted from the Teamwork Factors of Trust, Social Interaction and Task Management and Personal Characteristics of Instrumentality and Expressiveness at the individual level of analysis. Some researchers may be interested in how the data fit the model if students nested within teams are used.

Although other models may have superior fit as the model presented in Chapter 4 using the data at the individual level of analysis, I am also interested in testing the Social Interaction Teamwork Model using a multigroup, hierarchical path model developed to test the value of the TAS as an instrument to examine teamwork processes. A secondary purpose of the path analysis was to compare the models between the two types of Team Assignment (Self-selected and Randomly-assigned) with Team Membership included in the model as students were nested in their teams which were not included in the individual level of analysis. Type of team assignment was included as the participants in the study were students that came from two intact classrooms participating in the same course that worked in two types of teams.

The Social Interaction Teamwork Model tested the following hypothesizes:

For the relationships between Personal characteristics as antecedents of teamwork behaviors that:

Expressiveness predicts Social Interaction.

Instrumentality predicts Task Management.

Expressiveness and Instrumentality predict Trust.

Trust, had a direct effect on Social Interaction and Task.

Social Interaction predicts Task Management Team Flow and Team Synergy.

Trust predicts Social Interaction, Task Management, Team Flow and Team Synergy.

All paths to the variables were hypothesized to be positive as indicated in figure 1 Page 10 and that group membership would be salient influence in team performance. Also it was hypothesized that the data from Self-Selected groups would provide a better fit to the model than would the data from Randomly Assigned groups.

Path analysis was used in this study to test the plausibility of the proposed theoretical model among the sample of college students. Path Models include *exogenous* variables, whose variability was not explained in the model, and *Endogenous* variables, whose variability is attributed to other variables in the model. The main goal of a path analysis is to account for the covariances of observed exogenous and endogenous variables with a structural model of their presumed unanalyzed associations, spurious associations, and causal relations with each other. Independent or *exogenous* variables receive no causal input. In this study, Personal Characteristics were considered exogenous or Independent variables whose variability is not explained in the model. Positive Social Interaction, Trust, Task Management and Flow are endogenous variables whose variability is attributed to variables in the model.

The TAS teamwork variables of Positive Social Interaction, Task Management, and Trust, and the Team Performance variables of Team Flow and Team Synergy as endogenous or Dependent variables.

In order to take into consideration the nested nature of this data, responses were obtained at the individual level and students also provided information of two variables

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entered at the team level: Team Membership and Team Assignment. Team Membership was used as a clustering variable.

Two models were tested as an initial step in understanding team processes and performance and the effect personal characteristics have on teamwork under two different types of teams (Self-Selected teams vs. Random Assigned Teams). The first unconstrained model allowed paths to vary between groups; the final constrained model (See Fig. 5) constrains paths between groups to see whether the same model can apply to both groups.

The Chi-square statistic was used to test for differences between the tested model and an alternative model that perfectly fits the data. Thus a non-significant Chi-square value indicates that there is no significant difference between the fit of the tested model and a perfect model; that is if the Chi-square is non-significant, the tested model provides good fit to the data. The results found in testing the unconstrained and the constrained models are described next after the tables presenting the Correlations-Covariance matrix for each type of team in Table 29 for Self-Selected teams and in Table 30 for Randomly Assigned teams.

Table 29: Correlations Covariances Self Selected Teams

Covariances Self	SOCIAL	TASK	TRUST	ENG	INST	EXP
SOCIAL	0.24					
TASK	0.12	0.24				
TRUST	0.17	0.12	0.45			
FLOW	0.10	0.17	0.14	0.48		
INST	0.02	0.10	0.07	0.06	0.48	
EXP	0.17	0.02	0.14	0.05	0.06	0.29

Table 30: Correlations Covariances Random Assigned Teams

Covariances Randomly Assigned	SOCIAL	TASK	TRUST	FLOW	INST	EXP
SOCIAL	0.29					
TASK	0.16	0.30				
TRUST	0.22	0.24	0.50			
FLOW	0.12	0.14	0.18	0.52		
INST	0.03	0.16	0.13	0.11	0.29	
EXP	0.19	0.13	0.17	0.10	0.01	0.31

Variables

The path analyses examined the joint relationships between the Independent or *Exogenous* Personal Characteristics that included gender role orientation-specifically, Instrumentality and Expressiveness. The teamwork processes variables included Social Interaction, Trust and Task Management and the team performance was examined by Team Flow and Team Synergy. Special functions variables were a clustering variable, Team Number (N=71) and a grouping variable, Team Assignment (Self-Selected or Randomly Assigned participants). There were 35 Self-Selected Teams that had a total of 257 students participating. Also there were 36 Randomly Assigned Teams that had a total of 240 students participating in this type of team assignment.

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Overall Goodness of Fit

A number of estimates of the fit of a path model were available and indicated good fit of the data to the theoretical constrained model. Goodness of fit refers to how well the tested model fits the sample data. Standard MPlus 3.0 output provides several estimates of the goodness of fit: The Chi-square statistic; the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Residual (RMSR); the (SMRS). The Chi-square ratio is an additional, easily calculated estimate of goodness of fit recommended by Byrne (1989). The CFI of the final constrained model was .99, where >.95 is generally considered to be a reasonable cut-off for model fit. Another fit indicator that has gained acceptance for structural equation models, the RMSEA was at the acceptable limit, RMSEA<.06.

Both the initial unconstrained model and the final constrained model results (constraining paths between the variables, to be equal in both groups) indicated an adequate fit of the measurement model with a Non significant $\chi2$. The final constrained model with parameter equalities had a non-significant decrease in model fit in comparison with the first unconstrained model.

The difference of $\chi2$ from the final measurement model with parameter equalities to the hypothesized model showed that there was no significant decrease in fit, supporting the generalizability of the model to teams performing under different initial social interaction conditions.

The CFI of the final model was .99, where >.95 is generally considered to be a reasonable cut-off for model fit. The RMSEA was 0.03 which meets the cut off value of <.06. The fit of the constrained model and the initial unconstrained model without the Team Synergy were similar. From Initial Unconstrained paths ($\chi 2$=14.42) to Final Constrained Path Model ($\chi 2$=33.43): $\chi2$diff = 19.01, dfdiff = 17, p.>0.10. Thus the

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difference between the Unconstrained and Constrained Models is not significantly different from 0 and the fit of the constrained model and the unconstrained model were similar.

The path coefficients generated in the final test of the Social Interaction Teamwork Model, constraining the paths across Self- and Randomly -assigned Groups parameter equalities, are presented in Figure 5 below with the hypothesized causal ordering of the relationships predicting Teamwork dimensions and Team Flow and Synergy.

Table 31: Summary of Model-Fit Statistics Constraining Paths

Model	χ^2	Df	p-value	CFI	RMSEA
Unconstrained 2 Groups Paths: 1_ Self Selected Team Members 2_ Randomly Assigned Team Members	14.42	10	*n.s.*	.99	.04
Constrained Direct and Indirect Effects 2 Groups Paths: 1_ Self Selected Team Members 2_ Randomly Assigned Team Members	26.08	20	*n.s.*	.99	.03

Test of Nested Model fit constraining the paths with across Self- and Randomly Assigned Groups parameter equalities: $\chi^2_{\text{diff}} =12.06$, $df_{\text{diff}} = 10$, *n.s.*

The path coefficients generated in the final test of the Social Interaction Teamwork Model constraining the paths with across Self- and Randomly Assigned Groups parameter equalities, are presented next in Figure 5.

Figure 5. Social Interaction Model 2 Path Coefficients
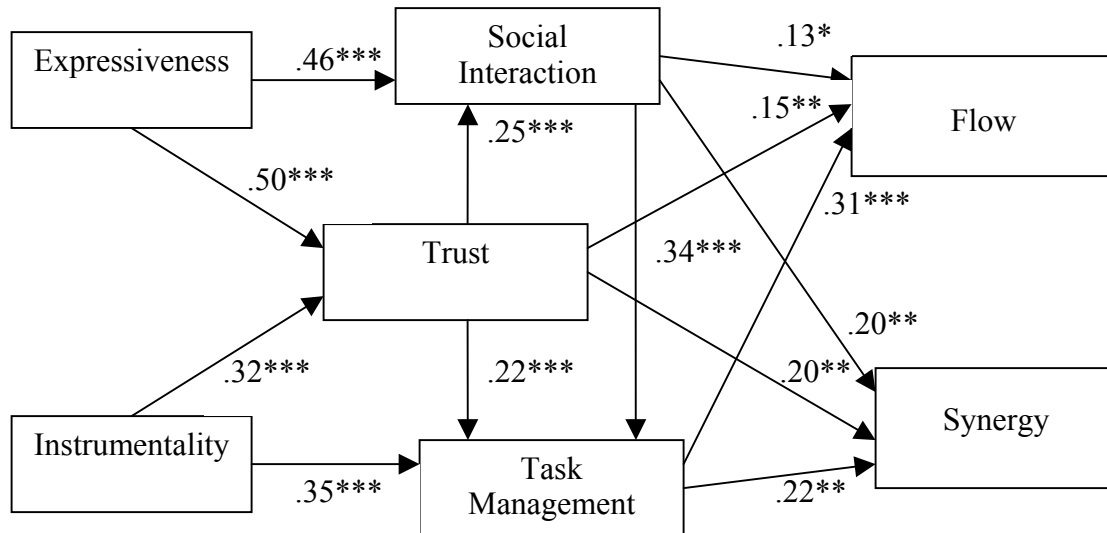
* = p<.05 ** = p<.01 *** = p<.001

     The figure presents standardized betas only following King (1989) recommendation that standardized betas are a more useful estimate of path coefficients because they represent the degree of change in a dependent variable given a single unit of change in the explanatory variable. Therefore standardized path loadings are reported for the final path model presented above in Figure 5, along with their measures of statistical significance.

     Decomposition of the direct and indirect effects in the final constrained model of teamwork is presented next in Tables 32 and Table 33. The direct effects represent a standardized estimate of the effect of the predictor variables on the dependent variables and may be used as path coefficients; however, because they are unstandardized, they are more difficult to interpret.

Table 32: Direct Paths Coefficients in the Final Social Interaction Model 2

	Standardized Beta Coefficients	Standard Error	Critical Ratio	Sig.
Dependent: Social				
Expressiveness	0.46	0.03	14.11	p<.0001
Trust	0.25	0.02	11.16	p<.0001
Dependent: Trust				
Expressiveness	0.50	0.05	9.63	p<.0001
Instrumentality	0.32	0.06	5.23	p<.0001
Dependent: Task				
Instrumentality	0.35	0.03	10.72	p<.0001
Social Interaction	0.34	0.04	9.14	p<.0001
Trust	0.22	0.04	6.06	p<.0001

The indirect effects are also unstandardized and represent the effects of the predictor variables mediated by other variables in the model. All Direct and indirect effects were significant.

Table 33: Indirect Paths Coefficients in the Final Social Interaction Model 2

	Standardized Beta Coefficients	Standard Error	Critical Ratio	Sig.
Dependent: Social Interaction				
Trust and Instrumentality	0.08	0.02	5.47	p<.0001
Dependent: Task				
Social and Expressiveness	0.16	0.02	7.72	p<.0001
Trust and Instrumentality	0.07	0.02	4.10	p<.0001
Trust and Expressiveness	0.11	0.03	4.34	p<.0001
Sum of indirect Effects from Instrumentality to Social Interaction	0.080	0.015	5.47	p<.0001
Sum of indirect Effects from Instrumentality to Task	0.07	0.02	4.10	p<.0001
Sum of indirect Effects from Expressiveness to Task	0.27	0.02	11.59	p<.0001

Variance Explained by the Model

The Squared multiple correlations (R^2's) represent the amount of variance explained by the model by each endogenous variable.

A significant amount of the variance in teamwork was explained by the variables in the model. The amount of variance accounted for Positive Social Interaction, in Self Selected Teams was 0.51 and 0.48 in random teams.

The amount of variance accounted for Trust in Self Selected Teams was 0.22 and 0.23 in Randomly Assigned teams. For Task Management in Self Selected Teams was 0.53 and 0.51 in Randomly Assigned teams and for Team Flow was 0.16 in Self Selected Teams and 0.15 in Randomly Assigned teams. In the case of Team Flow's R-

Squared the amount of variance explained indicates that more variables are needed to account for the relationships found. The low amount indicates that some important relationships are missing in the model.

As it is an exploratory analysis, the model needs to be further tested with new samples before drawing more definitive conclusions. Results indicated that the initial model was plausible in the sample of self selected and Randomly Assigned teams. Findings from the multiple-groups analyses provided evidence supporting the primacy of a safe and trusting positive social environment and its influences over the accomplishment of tasks and in predicting the engaged enjoyment in activities that challenge students to develop their skills and potential while working in high performing teams.

Summary of Path Model Predicting Team Flow and Team Synergy

Question four of this study examined the fit of the model in Figure 1 to data from a sample of college students. It was hypothesized that the model in Figure 1 would provide a good fit to the data. The overall indices of fit support the plausibility of the model in the sample data.

Arrows in the path model represented a hypothesized causal relationship in the direction of the arrow. All relationships specified in Figure 1 that were hypothesized to be positive, and the four theoretically based indirect effects were hypothesized to be significant were found.

The hypothesis that the proposed Social Interaction Model was plausible in the in the college students sample, was supported. Results of the path analyses indicated that the model of the relationships between personal characteristics and Teamwork was supported.

A non-significant decrease in model fit was found by applying the theoretical Path Model constraining the paths with across Self-Selected and Randomly assigned Groups parameter equalities.

Based on the joint criteria of fit, the Social Interaction constrained Path Model predicting Teamwork performance met the cutoff of fit indices. The model appeared to fit very well as judged by the fit indices.

The data collected in this study fit the model. As it is an exploratory analysis, the model needs to be further tested with new samples before drawing more definitive conclusions. Results indicated that the initial model was plausible in the sample of self selected and Randomly Assigned teams. Findings from the multiple-groups analyses provided evidence supporting the primacy of a safe and trusting positive social environment and its influences over the accomplishment of tasks and in predicting the engaged enjoyment in activities that challenge students to develop their skills and potential while working in teams.

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VITA

Maria Lourdes del Consuelo De Hoyos Guevara* was born in Monterrey, N. L. Mexico on November, 10th 1948, the daughter of Victor De Hoyos Cardenas(†) and Eva Abigail Guevara Menchaca(†). After completing her high school work at the Colegio Labastida, she entered the Universidad Autonoma de Mexico in the Universidad Labastida campus in September 1965 and completed the requirements for the Licenciatura en Psicologia in January, 1969. During the summer of 1966 she attended the University of California at Berkley. She had four daughters: Lourdes, Venus Victoria, Eva Veronica (†) and Angela Catalina Piñeyro de Hoyos. In August 1976, she entered the Graduate School of the University of Texas at Austin, where she was a student at the Educational Psychology Department. In 1979 she received a Master Degree in Program Evaluation and became a Doctoral Candidate. She went back to Mexico and after 15 years of university teaching and research, she returned to the University of Texas at Austin, this time to the Curriculum and Instruction Department to complete the Instructional Technology Ph.D. Program.

Permanent Address: 1000 Old England Road. Winter Park Fla. 32789

e-mail Address: marylu@teachnet.edb.utexas.edu

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*Also known as Marylu Menchaca.