

**Toward a Model and Measure of Self-Perception
of Team Learning Beliefs and Behaviors in a Sample
of Undergraduate Business Students**

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Dedication

To my friend Denise K. Hasley

Acknowledgments

I am blessed, and thank God, that I have arrived at this day. I would not be here if it were not for His love and grace. The journey to get here has been difficult, with many bumps in the road and personal struggles. I could not have made it here if not for many people whose help, support, and care made the difference. I am sure I will not remember everyone by name, but I will certainly try. My prayer is that my journey ahead will be less difficult, and that I will be able to be a blessing to others as they have been to me.

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Abstract of Dissertation

Toward a Model and Measure of Self-Perception of Team Learning Beliefs and Behaviors in a Sample of Undergraduate Business Students

Students seek to graduate from college with transferable team skills. At the same time, higher education institutions are under increased scrutiny to provide students with team skills. This study seeks to help students understand and learn from their team experiences by testing an individual measure and model of team learning. This measure and model will be a developmental tool for use in the business classroom, especially management education where team skills are typically taught.

Kayes and Kayes' (2007) process model of team learning was selected as the basis for the transferable team skills. A measure based on this model was modified in this study to focus on the individual team member. The resulting individual measure, the Self-Perception of Team Learning Beliefs and Behaviors Questionnaire, considered five team learning beliefs (the task beliefs of roles, goals, and team confidence and the interpersonal beliefs of trust and interpersonal understanding) and three team learning behaviors (coordinating, adapting, and continuous improvement). Relationships between the beliefs and behaviors were hypothesized. Testing of the measure and model was conducted in a population of undergraduate business school students.

Analysis of the psychometric properties of the measure included content validity, convergent validity, and reliability. Analysis resulted in three constructs with acceptable alphas: team confidence, interpersonal understanding, and continuous adaptive learning (CAL). Relationships among the resulting variables confirmed the relationship between CAL, the team learning behavior, and the team learning beliefs of team confidence and interpersonal understanding at the individual level. Results for relationships with

performance were mixed. Continuous adaptive learning was significantly related to some but not all performance measures. Recommendations include the call for further research to explore team learning beliefs and behaviors at the individual and team levels considering different team contexts and characteristics; further research regarding different performance variables; and further research regarding different individual self and peer perceptions.

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CHAPTER 1:

INTRODUCTION

Business schools are continuing to receive pressure to prepare students for today's business world. Students are expected to acquire not just theoretical knowledge but also the skills to apply their knowledge at work. This expectation for application of knowledge is reflected in the accreditation standards of the Association to Advance Collegiate Schools of Business (AACSB, 2008), which indicate the need to prepare students for their future careers and to be lifelong learners. One set of skills increasingly important is the use of teams because organizations have found many benefits to having employees work together (Freeman, 1996) to address a wide variety of business needs.

In response to the trend toward teams in the workplace (Cohen & Bailey, 1997), educators have been using teams in the higher education classroom. They recognize that acclimating students to working in teams prepares them for future work as a member of a team in organizations (Springer, Stanne, & Donovan, 1999). Specifically, universities have added team-based learning to the business curriculum to provide students with first-hand experience of the types of team dynamics that they will experience in organizations and to help them develop skills that will contribute to their future success (Oblinger & Verville, 1998; Roebuck, 1998). Over time, the team approach to learning has become widely accepted as an effective teaching and learning tool in higher education (Barfield, 2003).

Student team members have a wide variety of experiences in classroom learning teams. Some of these experiences may be more productive than others. For example, some students rely on the team environment to avoid doing work. In other cases,

however, students find working in a team a positive learning experience, where the contribution of others complements their experiences. Whether students rave about their team experience or bemoan their fate as a team member, they can learn from the experience. Although each team experience is different, all team experiences carry the potential to help students develop skills and abilities. All too often, however, these experiences are 'lost' and the potential learning is never realized, leaving students unable to capture the potential learning underneath these experiences. One reason that such learning is often lost is because there are limited frameworks or measures that help students capture and understand their experiences in teams. The purpose of this study was to identify a framework and measure for students to better understand and develop their team learning skills.

Framework for Individuals in Teams

Finding a framework to help students understand their value as a team member and their team experience in a specific team is not an easy task. This study specifically focused on developing a framework and measure for assisting individuals, not teams. While it is expected that improved individual skills will lead to better teamwork, the focus of this study is the specific individual beliefs and behaviors that contribute to team performance.

Prior work has led to a better understanding of the individual role in the team context. By observing teams, Belbin (1981, 1993) identified nine different roles that team members enact. The Team Role Self-Perception Inventory was developed to help individuals understand their role preference. This tool allows individual learners to identify their preference within teams in general, not in a specific team. Individuals can

use this information for general development involving their preferences, not their skills. An entire team will benefit if all team members complete the survey, since they can compare preferences and identify gaps and overlaps between team member preferences. This knowledge allows team members to better understand how their role preferences fit with other team members' preferences but not how skilled they or their team are at the role.

Kline (1999) developed a measure to assess individuals' predisposition to team working environments. The validated measure, Team Player Inventory, asks individuals their preferences related to working on a team. This measure is helpful when team involvement is voluntary but does not provide a way for team members to better understand their mandatory team experience.

Burch and Anderson (2004) reviewed the development of the Team Selection Inventory (TSI), an individual-level version of the Team Climate Survey (TCS). The aggregate of all team member responses to the TCS provides a baseline for the team's climate in four areas (i.e., team vision, task orientation, support for innovation, and participation safety). An individual's TSI score in each area can be compared with the team's climate scores to determine the degree to which the individual fits with the team. The TSI is about individual preferences in general and is compared to a specific team climate (TCS).

These examples of individual measures relate to team processes, team composition, fit to the team, and individual roles. They do not provide a complete framework for students to understand their contribution to team learning and the skills they need to improve as individual team members. To gain a better understanding of their

team experience, team members need a more complete framework that will allow them to learn from each of their team experiences in and beyond the classroom.

A Team Learning Framework

A process model of team learning was chosen as the team framework in this study. Team learning (Druskat & Kayes, 2000; Edmondson, 1999; Kasl, Marsick, & Dechant, 1997; Kayes, Kayes, & Kolb, 2005; Van den Bossche, Gijsselaers, Segers, and Kirschner, 2006) was selected as the basis for team skills for three primary reasons. First, team learning is considered a critical factor supporting organizational learning, making it an important concept to understand and skill for students to develop. Second, this study draws from the group process perspective of team learning, which has been developed primarily in field studies (Edmondson, Dillon, & Roloff, 2007). Third, a process-oriented team learning model provides a comprehensive framework for team functioning (see Hackman, 1987) and for integrated learning beliefs and behaviors that cover both the cognitive and behavioral elements of the team process.

The team learning model was chosen for two reasons. First, the origins of the chosen process model (Kayes & Kayes, 2007) allowed for more nuanced discussion. For example, shared task beliefs are identified through three separate constructs: roles, goals, and team confidence. This nuanced approach allows for a more fine-grained understanding of the team experience. Second, the model focuses on team learning beliefs and behaviors that an individual member can influence and does not include other factors such as organizational context (e.g., Edmondson, 1999) that an individual cannot influence. The model, described in detail in chapter 2, provides a visual depiction that learners can refer to when understanding their team experience.

To further help learners understand their own involvement, an individual team member measure is introduced in this study the - Self-Perception of Team Learning Beliefs and Behaviors Questionnaire. Specifically, this measure assesses the individual team members' self-perceptions of team learning beliefs and behaviors proposed in the model. Although the measure is completed about a specific team, individuals can benefit from it with or without the participation of all team members. Importantly, using individual results, a learner can reflect on his or her experience on the team; with the participation of multiple team members, the entire team can discuss the composite results and further enrich their learning. The individual measure was adapted from a leadership measure (Kayes & Kayes, 2007) based on the same process model of team learning.

Overview of the Study

The purpose of this study was to assess a framework and measure related to the model, the team learning process model and Self-Perception of Team Learning Beliefs and Behaviors Questionnaire respectively, for use in the business education classroom to teach and develop student team learning skills. The model and measure will bring industry-developed theory into the business education classroom. The hope is that students who understand and experience team learning in the classroom will be better prepared to work in industry.

The second chapter reviews relevant learning literature that provides a conceptual framework for the study, describes the proposed process model of team learning, and hypothesizes relationships at the individual level. A second model, the Individual Contribution to Team Learning Model, is presented based on these hypotheses.

The methods used to adapt and review the team member Self-Perception of Team Learning Beliefs and Behaviors Questionnaires and the administration of this measure and other supporting measures are outlined in chapter 3. The fourth and fifth chapters present and discuss the results of the study.

Contribution of the Study

This study contributes to the growing team learning and business education literature by developing an individual team member measure of team learning beliefs and behaviors; confirming relationships among the beliefs and behaviors at the individual level; and, identifying areas of future research related to team learning beliefs, behavior, and performance.

This study tested the reliability and validity of a new measure, the Self-Perceptions of Team Learning Beliefs and Behaviors Questionnaire. This is the first developmental measure at the individual level based on the team learning literature to be validated for adult learners. The measure was tested in an undergraduate-level business education classroom. It provides an initial developmental tool for instructors to use with students in the classroom. As future research identifies team learning beliefs and behaviors that are appropriate for different team contexts and characteristics, teams of other adult learners may benefit from this work as well. An individual measure of this kind is also advantageous to researchers who seek to better understand the impact of individuals on teams and how to better develop individual skills.

Understanding the relationships between team learning beliefs and behaviors at the individual level adds to the literature and benefits both researchers and instructors. Researchers will be better able to understand the individual contribution to the team

process. Instructors will be better able to understand how to coach and support student teams.

CHAPTER 2: LITERATURE REVIEW

This chapter reviews literature on learning as a conceptual framework for the study. Special attention was given to the team learning literature, as this study seeks to measure and help students understand and develop team learning skills. The process model of team learning used in this study is explained in detail. The individual measure developed from the model is discussed, and the Individual Contribution to Team Learning Model is introduced.

Conceptual Framework

This study draws on the rich history of learning theory, which stretches across many academic disciplines. Within these disciplines, various theories of learning have been developed at different levels of analysis and in different contexts. Research has been focused on adult learners in the formal education setting, in their place of work, and in their daily lives.

This study focuses on the individual as a learner and specifically on individual knowledge and skills related to teamwork. It draws on the importance of individual experience and reflection when learning. The following discussion to establish the conceptual framework for this study explores the levels of learning and the importance of experience and reflection to the individual learner.

Levels of Learning

Learning is studied at the individual, group, and organizational levels. All three levels are influenced by one another. The learning of the individual is impacted in part by

the team and organizational environment. Team and organizational learning are enacted through individual learners. The focus of this study was the individual's enacting team learning.

Learning at the Individual Level

Individual learning has a rich history. A good place to begin is in the 1900s, with the Russian physiologist Ivan Pavlov, who developed what is now known as classical conditioning (Todes, 1997). He theorized that learning (which he defined as change in behavior) is created by an individual's responses to stimuli prior to the behavior. Operant conditioning, as proposed by behavioral psychologist B. F. Skinner, suggests that learning is based on the reinforcement that takes place after the behavior (Skinner, 1963). Another influential approach was put forth by Thorndike (1912), who suggested that learning is founded on change (intellectual, physical, etc.) and that the learning process starts with habit formation through repetition and reinforcement from interactions with the environment.

Bandura's (1977) social learning theory suggests that behavioral, environmental, and personal factors are interlocking determinants of each other. In contrast to the idea that learning is the result of trial and error, Bandura suggested that learning occurs almost entirely vicariously by direct experience and observation of others. While other theories focus on the external influences as the sole agent of behavior change, social learning theory suggests that through self-regulatory processes, individuals are the agent of their own change. Behavior is influenced by reciprocal interaction between cognitive, environmental, and behavioral determinates. A person's behavior is not entirely dependent on environmental influences, nor is it solely a matter of personal choice.

These early theorists introduced the idea that the environment, including interaction with and observation of others, plays a critical role in individual learning. These researchers, however, primarily addressed the individual learning in formal classroom settings or in daily life activities, not specifically organizational settings. Focus on learning in organizations opened up a new understanding of learning, where formal (and informal) teams are arranged within an organization.

Learning in Organizations

In 1990, Peter Senge wrote *The Fifth Discipline* in order to “put a stake in the sand” (p. ix) regarding the learning organization, which he called a management fad. He defined learning organizations as “organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together” (Senge, 1990, p. 3). Argyris and Schon contributed to the theory of organizational learning by attempting to combine both the practical and values-driven focus of the literature (Argyris, 1993; Argyris & Schon, 1978, 1996). Argyris and Schon (1978) argued that organizations are more than a collection of individuals, though they act by the agency of individuals. They recognized that using terms like “memory” and “learning”—words commonly used in reference to an individual—is somewhat metaphoric when referring to an organization. They contended, however, that organizational learning is different from individual learning, though learning is taking place through individuals. The study of organizational learning has continued and is conceptually considered a valuable contributor to organizational effectiveness.

Learning Through Teams

Edmondson (1999) looked at learning with a team lens in order to identify an understanding of learning that complemented existing individual and organizational learning theories. She agreed with Senge (1990) that the team is the fundamental learning unit of an organization. Edmondson (1999) suggested that when teams at different levels of the organization fail to adequately reflect, the organization as a whole misses incremental and radical learning opportunities. Team learning in this context is a social process of individuals working together rather than a process of individuals learning in a team.

The knowledge and skills related to team work that this study seeks to develop in individual learners are based on this team learning group process. Individual learners bring to the team a set of skills, knowledge, abilities, and experience. They function as a team in a social process called team learning. The team's learning then becomes the unit of learning for the organization. A recent meta-analysis has shown that team processes have a positive relationship with team performance (Le Pine, Piccolo, Jackson, Mathieu, Saul, 2009)

The three levels of individual, team, and organizational learning, although overlapping, have each developed into their own distinct research streams. While the relationship among these three levels of learning will not be explored further in this study, it is important to recognize that the value of this study is in part due to the benefit provided to organizations through skilled individuals. The specific focus of this study is on individuals learning and reflecting on team learning beliefs and behaviors in order to improve their team skills.

Experience and Reflection: The Basis of Learning

This study is based on the notion that by providing students with a team experience and the tools to understand that experience, they will be better prepared to work as a team member in an organization. Students will achieve better preparation by reflecting on their experiences. This notion is drawn from a long history of theory that includes the call for and the application of experience and reflection in the learning process.

Dewey (1938), an educational philosopher, addressed the issues surrounding the formal elementary through adolescence educational system of his time. He described the current educational system as one where teachers were expected to instruct students in the current organized body of knowledge while enforcing moral codes with the expectation that students would be prepared for a successful adult life. Dewey discussed the inability of the young students to participate in learning because of the large gap between their experience and the adult-focused learning that was expected. He suggested that experience is an essential process of learning. While the importance of experience in learning may be a common understanding now, it was groundbreaking in the 1930s.

Dewey's conclusions about the issues surrounding the educational system of his day have a striking resemblance to some of the issues facing higher education, particularly in business education. There is often a gap between students' experience and learning focus. For example, traditional undergraduate students are asked to learn about management when most have never been managers. They, like the students of Dewey's day, have the benefit of observing the environment they are learning to become a part of;

however, there is a gap with their experience. This gap, experience working in teams, can in part be addressed by having students work in teams as they learn.

In 1972, Schein published a review of the state of professional education, i.e., higher education. He identified barriers to learning ranging from the rigidity of the academic process and career socializations to the attitudes of the professors, professionals, and students. Two of the four major changes suggested by Schein relate to this study: the development of new kinds of learning modules built on better theories of how students learn and the need for perpetual self-diagnosis and evaluation research (p. 129). In the 35+ years since this publication, colleges and universities are still addressing these issues. This study seeks to address these issues by building on learning theory and providing a self-diagnosis tool for students.

Learning researchers have sought to extend their understanding of learning with behavioral and cognitive theories, including the discussion of experience. Kolb (1984) attempted to integrate the various perspectives—behavior, cognition, perception, and experience—into one theory, Experiential Learning Theory (ELT). He summarized the theoretical foundations, process, and application of ELT for individuals in his 1984 book. Kolb defined learning as “the process whereby knowledge is created through the transformation of experience” (p. 38). The focus moved from learning as an outcome to learning as an ongoing process that includes a tension between experience and reflection. As individuals engage in a new experience, they must balance fully engaging in that experience and reflecting on the experience. Kolb did not limit this experience to the formal classroom setting but saw the opportunity for learning at any time and place through interaction with the environment. Although much of his initial work was directed

at the individual learner, ELT has also been applied to teams (Kayes, Kayes, & Kolb, 2005).

Kolb's research was influenced by a number of researchers, including Kurt Lewin, who somewhat serendipitously discovered the value of feedback and reflection (Kolb, 1994; Marrow, 1969). Lewin began a sensitivity training project at the request of the Connecticut State Inter-Racial Commission, which desired training and research in the area of religious and racial prejudice. Marrow (1969) described this research event that led to discovering the role of feedback in t-groups (training groups). Lewin and his colleagues observed and recorded the training sessions and discussed the trainees' behavior each evening. Trainees who were not able to go home at night asked to join the discussion sessions with the researchers. Trainees began to spend time appraising their own behavior and participating in discussions with the researchers. The event was a huge success, both at the time of the training and in its application in the trainees' work life.

Lewin's impact is clearly visible in the development of ELT (Kolb, 1984) and demonstrates the importance of providing students with the ability to talk about their own behavior as it relates to a team. Other researchers have also elaborated on the importance of reflection for the practitioner and student (Schon, 1983).

Schon (1983) discussed learning as a reflective practice. He argued that learning from reflection-in-action is similar but distinct from controlled experiments and scholarly research, where professional knowledge is viewed as scientific theory and technique being applied to real-world problems. Schon (1983) described knowing-in-action as "an application of knowledge to instrumental decisions" (p. 50). Daily activities are performed through tacit, implicit knowledge, which is not easily described. Schon

paralleled daily activities with the professional who also performs professional responsibilities while using tacit knowledge. Knowing-in-action is not done apart from the conscious use of theoretical and scientific knowledge; rather, it is the tacit judgment, skill, or recognition of how something should be performed that the professional depends upon. When a person reflects on the knowing-in-action, during or after the activity, the process of reflection-in-action begins. Through the formal use of reflection-in-action, a person can learn about his or her implicit knowledge as knowledge-in-practice.

Schon pointed out that managers' reflection-in-action can be limited by formal learning systems and other processes. Managers may not reflect on their actions when the actions have met the requirements of a formal system; however, by reflecting, managers may identify a nonnormal problem that needs to be corrected. Students can develop this reflective practice in many learning environments. Schon (1987) explained how reflection-in-action is utilized in a creative learning environment. As students work through educational problems, instructors ask reflective questions and add pieces of knowledge to assist the students' reflection in the learning process.

The process model of team learning presented in this study is a visual depiction of a team process. Such a model provides a common language for learners to discuss and reflect, as individuals or as a team, on their team experience. The model provides the opportunity not only for initial reflection but for ongoing reflection-in-action. The measure developed in this study seeks to further enhance the learners' experience and reflection by providing students with specific feedback about their own team learning beliefs and behaviors presented in the model.

The common language and feedback of the model and measure provide an excellent opportunity for students to develop their skills related to team learning, thus closing the gap between experience and the learning focus discussed by Dewey (1938). It also provides a means for students to engage in reflective practice, with the benefit of the theoretical and scientific framework of team learning.

Team Learning

Research on team learning is complicated by a number of factors. First, it is important to note that there is much agreement that team learning improves team and organizational performance (Druskat & Kayes, 2000; Edmondson, 1999; Yeh & Chou, 2005). However, there is not one research-based definition or description of team learning on which researchers can agree (Kasl, et al., 1997). Team learning has been defined in terms of behavior, outcomes, understanding, change of behavior or attitude, performance, collective knowledge, shared experience, problem solving, and team norms (Edmondson, 1999; Ellis et al., 2003; Feldman, 1984; Gibson & Vermeulen, 2003; McKenna, 1995). Learning has been described as both an outcome (Crossan, Lane, & White, 1999) and a process (Argyris & Schon, 1978). Researchers have looked at team learning as a process of routines (Edmondson, Bohmer, & Pisano, 2001). Classical models suggest that routines are an evolutionary process and change slowly (Nelson & Winter, 1982). Levitt and March (1988) defined routines as “forms, rules, procedures, conventions, strategies and technologies around which organizations are constructed and through which they operate” (p. 320). Studies have been conducted as to how and why these routines change. Edmondson et al. (2001) built on the concept that technology is a

trigger for changing organizational routines and explored team learning in an operating room team when new technology was implemented.

Despite the confusion, a recent review of team learning may provide some clarification by identifying three areas of team learning research: outcome improvement, task mastery, and group process (Edmondson et al., 2007). The first, outcome improvement, focuses on improved efficiency. Task mastery has primarily been studied in labs and focuses on a team member's skills and knowledge related to a specific task. The third area of study is the group process. The team learning theory used in this study draws from this area of research. Group process-focused team learning has been primarily studied in field research and focuses on processes and behaviors in the team. It draws on the organizational learning and team effectiveness literature (Edmondson et al., 2007).

Edmondson et al. (2001) developed a process model for team learning in the context of establishing new technological routines. The steps in the model are enrollment, preparation, trials, and reflection, where trials and reflections are repeated. These steps vary in definition and practice based on the outcome of the implementation. They are reflective of Kolb's learning cycle.

In her earlier work, Edmondson (1999) developed and tested a model of work-team learning that addresses the antecedents, beliefs, and behaviors of team learning that lead to team performance. Other researchers have followed this input-process-output model, where beliefs are the input, behaviors are the process, and performance is the output. Researchers have introduced other elements, such as the influence of team structures on beliefs (Edmondson, 1999). They have used different terminology; for

example, beliefs have been referred to as team dynamics (Prati, Douglas, Ferris, Ammeter, & Buckley, 2003). They have also varied what they include within each element; however, the basic beliefs, behavior, and performance model has remained.

In addition to Edmundson's original study, Van den Bossche, et al. (2006) tested a model of team learning beliefs (task cohesion, group potency, psychological safety, etc.), team learning behaviors, and team effectiveness. Their unique contribution was the introduction of shared cognition. Prati et al. (2003) proposed a model that suggests that team dynamics (trust, role awareness, etc.) influence team behaviors (group interactions, collaboration, etc.), which in turn influence team effectiveness. They introduced the idea of leader characteristics. Van Der Vegt and Bunderson (2005) tried to better understand the role of expertise diversity in team learning and suggested that learning behaviors mediate the relationship between expertise diversity and team effectiveness.

Kasl et al. (1997) defined team learning as "a process through which a group creates knowledge for its members, for itself as a system, and for others" (p. 229). They identified five interdependent learning processes: framing, reframing, experimenting, crossing boundaries, and integrating perspectives. They went on to explore these processes within stages of team learning: fragmented, pooled, synergistic, and continuous. Barker and Neailey (1999) suggested an individual/team learning methodology with four progressive stages: individual learning, functional learning, whole team learning, and communication of learning. The Barker et al. methodology and the Kasl et al. stages of learning, although named differently, are similar. Each starts with the individual and moves to sharing knowledge, which is then incorporated into the team as a

whole. This last note, that team learning is based on individual learning, is an important element of the team learning model that is proposed next.

The Team Learning Model

For the purpose of this study, team learning is defined as a team-level process of member behaviors that include reflection, knowledge sharing, experimentation, feedback, error correction, helping, and continuous improvement that address team-level outcomes (Druskat & Kayes, 2000; Edmondson, 1999). This definition provides an advantage in that it defines team learning in terms of behaviors that serve as a proxy for team learning. The model is presented in Figure 2-1 as adapted from Kayes and Kayes (2007). It is an input-process-output model (also called a systems approach) following in the tradition of the process model research area of team learning (see Hackman, 1987). Shared beliefs serve as the antecedents, or inputs, to effective team learning behaviors. Team learning behaviors serve as proxies, or visible evidence of learning; and performance serves as the outcome.

This model was chosen because it was developed from the literature on team learning in an industrial or business setting; thus it provides the basis for the skills needed in the business education context (Kayes & Kayes, 2007). It identifies eight beliefs and three learning behaviors. This model is unique in that it provides a more robust model of learning than previously tested and it identifies three distinct learning behaviors, each measured by distinct scales. Despite suggesting multiple elements to team learning, researchers have measured team learning as a single construct (Druskat & Kayes, 2000; Edmondson, 1999; Van den Bossche et al., 2006). This model intentionally seeks to

consider the behaviors in three distinct constructs in order to provide more refinement that will help students better understand and develop their team learning behaviors.

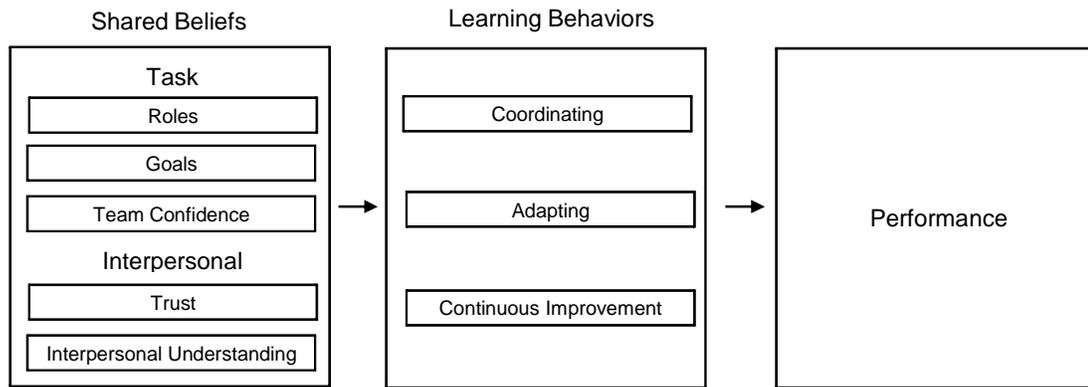


Figure 2-1. The process model of team learning. (Kayes and Kayes, 2007)

Shared Beliefs

Shared beliefs are a team-level belief about interpersonal relationships that provide the social context necessary for learning behavior to take place (Van den Bossche et al., 2006). The idea is that the learning is local, interpersonal, and reflects an individual's perception of the social climate (Edmondson, 2003). These shared beliefs are an essential prerequisite to team learning (Van den Bossche et al., 2006). They set the team environment in which learning can take place. Shared beliefs include the shared knowledge or agreement among members that impact the learning environment. The model divides these shared beliefs into two areas: task-related beliefs and interpersonal beliefs. The basis for two sets of beliefs can be found in Benne and Sheats' (1948) early work on groups, which identified two dimensions to team success: a task dimension and an interpersonal dimension.

Task Beliefs

Task beliefs are defined as “the degree to which a team shares beliefs or values related to the task or problem it faces and include three specific beliefs” (Kayes & Kayes, 2007, p. 12). Team learning task beliefs include: roles, goals, and team confidence.

Roles. Roles are defined as “the degree to which team members have a distinct division of labor, understand the strengths and weaknesses of other members, and know the unique skills or tasks assigned to other members” (Kayes & Kayes, 2007, p. 12). Team members can play a variety of different roles as part of team interaction (Benne & Sheats, 1948). The construct of roles is conceptualized in the model as a belief rather than a behavior because it is important for team members to have knowledge (belief) that they have different roles before they begin any activity (behaviors) related to those roles. Shared knowledge about others in the team begins through formal structured introductions or through common experiences. In either case, when members know the strengths and weaknesses of each member, they can appropriately assign tasks.

Even distribution of labor in teams leads to increased learning (Ellis et al., 2003). When work is assigned to the person more suited to the task, members are empowered to do their work and to be stretched to do more (Garfield, 1986)—rather than becoming frustrated, feeling that their expertise is not acknowledged or valued. In addition, knowing who is assigned what tasks reduces redundancy and gaps in the team’s effort. Clarifying roles by understanding the division of labor and the unique skill sets of members leads to increased coordination (Hara, 2003) in the team.

Goals. Shared goals are defined as “the degree to which the team members share perceptions that they have a clear and shared goal or common purpose” (Kayes & Kayes,

2007, p. 12). Team members' goals are not the same as the shared team goal, nor are shared goals the sum total of individual goals (Mills, 1967). Both individual and team goals are important to establishing the team learning environment of shared beliefs. In the management education classroom, where teams are required to complete a team project, the team's shared goal may be to complete the course requirements. Individual goals may vary: one may want to select a specific topic for the project that is in line with his or her existing knowledge, while others may have the goal of learning the content of the class for a specific non-class-related reason or completing the course because of the larger degree requirements. The shared goals reside in the minds of the team members as the desired state of the team and the desired state of the individual (Mills, 1967).

Teams with a common direction and common outcome are more inclined to work together to meet their shared goal. Team goals that are cooperative have been shown to increase information sharing and learning (De Dreu, 2007). Van den Bossche et al. (2006) found that teams that were committed to achieving a goal that required their collective effort also experienced more team learning behaviors. A team must consider how the individual goals fit with the larger team goal (Mills, 1967); this avoids conflict between the individual and team goals and may even ensure that they are complementary.

Team confidence. Team confidence is defined as “the group confidence level, in terms of how strongly the group members share the perception that they can accomplish the task put forth before them” (Kayes & Kayes, 2007, p. 12). Team confidence can also be expressed as group efficacy or group potency and is not the sum total of individual confidence.

Self-efficacy (Bandura, 1982) considers the confidence that individuals have related to their ability. Group efficacy is the group's beliefs about the group's ability to perform well (Gibson, 1999; Pescosolido, 2003). It arises from group interaction, context, and prior team performance (Gibson, 1999). Van den Bossche et al. (2006) used the term *group potency* to describe the collective belief of the team about their ability to be effective.

Team confidence has been related to both team performance/effectiveness and to learning behaviors. Pescosolido (2003) found that team confidence increased project grades and members' willingness to continue with the team. Druskat and Wolff (2001) identified team confidence as one of the three conditions essential for team effectiveness.

Team confidence has also been shown to be positively related to learning behaviors (Edmondson, 1999; Gibson, 1999; Van den Bossche et al., 2006). The degree to which these relationships exist is mixed. Edmondson (1999) found support for the relationship but found mixed support when controlling for team psychological safety.

Interpersonal Beliefs

Interpersonal beliefs are defined as "the degree to which a team shares beliefs or values related to other members of the group's feeling, mood or intention" (Kayes & Kayes, 2007, p. 12) and include the following two beliefs: trust and interpersonal understanding.

Trust. Trust is defined as "the shared perception by team members about the nature of the group and its members (including the leader) regarding the psychological climate, emotional disposition of the group, and the degree to which members of the group are willing to share sensitive information, especially as it relates to people's ability

to feel safe to make or admit errors and mistakes, or take challenging or controversial positions without fear of serious repercussions” (Kayes & Kayes, 2007, p. 12). Trust in this model is intended to include psychological safety.

Edmondson (1999) differentiated between the two constructs. She suggested that psychological safety stems from mutual respect and trust, such that team members are confident that they can speak up without being embarrassed, rejected, or punished. She saw psychological safety as the climate of trust. Trust as one of the shared beliefs that creates the environment for team learning encompasses the climate described by Edmondson as psychological safety. Social systems, like that in a team, are tied together by trust (Weick & Roberts, 1993). A review of trust in organizations finds competing definitions and conceptualization of the concept (Kramer, 1999).

Psychological safety has been found to be important when implementing new technology (Edmondson et al., 2001) and has been identified as one of three essential conditions for group effectiveness (Druskat & Wolff, 2001). There has also been support for psychological safety being associated with team learning behaviors (Edmondson, 1999; Van den Bossche et al., 2006). Edmondson (1999) found that team learning behavior mediates between team psychological safety and team performance.

Interpersonal understanding. Interpersonal understanding is defined as the “degree to which team members can recognize and comprehend the emotional states, preferences, . . . or relationships of individuals in the group” (Kayes & Kayes, 2007, p. 12). The original definition included skills, but that has been excluded here, since understanding of team member skills and preferences was captured in the roles construct.

Interpersonal understanding can in part be considered an element of group emotional intelligence.

Druskat and Wolff (2001) identified three levels of emotional intelligence: individual, group, and cross-boundary. Group emotional intelligence occurs when members of the group pay attention to other members' emotions. High group emotional intelligence can be built when one member takes pains to consider matters from another member's perspective (Druskat & Wolff, 2001). Awareness of other members' emotions creates the environment in which action can be taken to positively address the emotional states of other members. Allowing individual members in a group to influence the emotional state of other team members has been called *emotional contagion* (Barsade, 2002). Positive emotional contagion can increase the positive group mood. Barsade (2002) found that positive group mood can lead to greater group cooperation.

Druskat and Kayes (2000) considered interpersonal understanding as an input variable that positively influences team learning, where team learning is defined as behaviors related to seeking and sharing knowledge. They defined interpersonal understanding to include understanding of both preferences and skills. The conceptualization of interpersonal understanding in the team learning model in this study does not include skills; rather, understanding of skills is captured in the roles category under shared beliefs.

Learning Behaviors

Learning behaviors are the social process of interaction among group members and characteristics of their discourse that build mutual understanding and shared cognition (Van den Bossche et al., 2006). They are team activities that allow the team to

adapt and improve as they obtain and process data (Edmondson, 1999). This is not the sum of individual activities or individual knowledge. It is a social process where one person's contribution is presumed to build upon another's—for example, coconstruction of meaning (Van den Bossche et al., 2006). These behaviors act as a proxy for the learning that is taking place at the team level (Edmondson et al., 2007).

Coordinating

Coordinating is defined as “the seamless, often tacit or unconscious, organizing of diverse roles; coordination of knowledge and responsibility in teams” (Kayes & Kayes, 2007, p. 13). An individual has been viewed as learning tacitly (Fiol & Lyles, 1985; Schon, 1983). The group level is no different. Team members must work together, coordinating their efforts often without verbal or direct communication. This behavior is the visible sign that collective learning is taking place.

The need to share information when learning occurs at a collective level has long been established in the organizational learning literature (Argyris, 1993; Fiol & Lyles, 1985; Levitt & March, 1988), and it has been included in learning behavior constructs (Edmondson, 1999). Weick and Roberts (1993) suggested that reliable team performance may require a well-developed collective mind.

Adapting

Adapting is defined as “responding to [unexpected] internal and external demands [resulting from problems and roadblocks] by adjusting actions and beliefs” (Kayes & Kayes, 2007, p. 13). To clearly distinguish adapting from continuous improvement, emphasis has been added to the original definition in two ways: by clarifying that (1) this

construct focuses on the unexpected rather than routine issues that arise, and (2) these demands may be viewed as problems or roadblocks.

Teams in the classroom, as in organizations, face many unexpected problems. Team members' schedules suddenly change, technology issues arise, and new understanding about task requirements becomes apparent throughout the project. When these situations develop, a team must know how to respond to the problem.

In uncertain situations, teams need to coordinate members' actions (Edmondson, 2003). Proactively, members can talk about errors and determine a collective response. In this way, adaptation is a learning behavior that includes talking about errors (Edmondson, 1999). The crew of a ship used adapting when the ship suddenly lost critical navigation capability while docking. Through adapting they found new and creative ways to keep the ship from running into the dock and in time docked the ship properly (Hutchins, 1991). In the same way, personnel on aircraft carriers have been seen to adapt to sudden changes (Weick & Roberts, 1993) in the environment.

Continuous Improvement

Continuous improvement is defined as “working together to [incrementally] improve the [team’s] ability to learn and respond to . . . [ongoing and routine] challenges by sharing information [and avoiding mistakes]” (Kayes & Kayes, 2007, p. 13). The definition has been modified from the original to emphasize the routine, incremental nature of these changes. While adaptation focuses on the team’s response to the unexpected or problems, continuous improvement speaks to the team’s ability to make incremental improvements to the team’s processes and procedures so that mistakes are avoided.

The team's ability to find better ways of accomplishing tasks and sharing and managing information is well established as a learning behavior. Zellmer-Bruhn and Gibson (2006) considered team learning to be "the extent to which a team created new processes and practices" (p. 509). Van den Bossche et al. (2006) described learning behaviors as a collaborative (co)-construction of knowledge. Edmondson (1999) included experimentation and seeking feedback as part of learning behaviors. Druskat and Kayes (2000) conceptualized team learning behavior to be a team's continuous evaluation of itself and changing processes and procedures.

Self-Perception of Team Learning Beliefs and Behaviors Questionnaire

To facilitate individual students' understanding of their own team learning beliefs and behaviors, an individual measure, the Self-Perception of Team Learning Beliefs and Behaviors Questionnaire, was developed in this study. The underlying assumption is that individuals are active participants in teams and are therefore agents of team learning. As individuals gain experience on one team, they will carry that learning to other teams. Even though a particular team has its own character, the skills required in team learning are transferable across various teams.

Figure 2-2 depicts the relationship between the individual measure and the model. The top three boxes represent shared beliefs, learning behaviors, and performance elements of the model (the details within and between these elements have been removed for simplification). The individual measure developed for this study is represented by the individual self-perceptions. The self-perceptions of each team member, represented by the upward arrows, create the team's shared beliefs and behaviors.

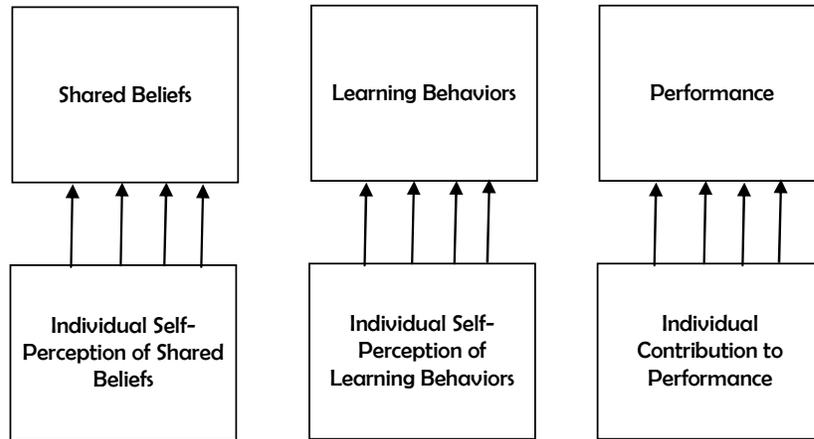


Figure 2-2. Relationship of the individual measures to the team learning model.

The final element is performance, which is the outcome in the model. Team performance can be measured in a variety of ways: performance metrics, goal attainment, and project evaluation. The individual self-perception questionnaire measures the individual's contribution to the shared beliefs and behaviors. In the same way the individual performance of each team member leads to the team performance. It is important to not confuse individual performance with the individual's contribution to the team's performance, although it is common for individual performance, in whole or part, to be evaluated separately from the team. The performance measure must be at the individual level to maintain consistency with the self-perception measure. At the same time, however, the performance must be related to the team's performance to maintain the relationship with the model.

Since the context explored in this study is undergraduate business education, the learning objectives in business education often involve gaining a certain amount of knowledge through completion of assignments. Performance on team and individual assignments is evaluated to assess attainment of knowledge objectives. Team

assignments may include a collective paper, presentation, exam, or experiential activity. Individual assignments might include papers and presentations, but they are completed separately from the team. For the purposes of this study, the appropriate measure is the portion the individual contributed to the team's performance—in other words, the degree to which the individual's performance led to the team's performance on the team assignments. Peer evaluations are an effective way to assess the individual's performance related to the overall team performance and are also an individual measure of performance. The performance being measured, however, directly relates to the team's performance.

Hypotheses Related to the Individual Measure

Reliability of the Measure

The individual measure developed for this study is based on the five beliefs and three behaviors discussed above. Each of these eight constructs is a unidimensional construct within the larger model. The first set of hypotheses focus on the factor structure of the measure. Hypotheses regarding factor structure are not always explicitly hypothesized in many studies. Explicit hypotheses were developed in this study to emphasize the study's focus on testing the measure. The six identified items anticipated to measure each construct is hypothesized to be internally consistent.

H1a: Items related to roles will be internally consistent.

H1b: Items related to goals will be internally consistent.

H1c: Items related to team confidence will be internally consistent.

H1d: Items related to trust will be internally consistent.

H1e: Items related to interpersonal understanding will be internally consistent.

H1f: Items related to coordinating will be internally consistent.

H1i: Items related to adapting will be internally consistent.

H1j: Items related to continuous improvement will be internally consistent.

H2: Within-construct items will be more highly interrelated than between-construct items.

Hypothesized Relationship Among Constructs Within the Measure

The second set of hypotheses focus on the relationship among belief and behavior constructs. As depicted in the model, the five beliefs are antecedents to the three behaviors. Beliefs and behaviors are different in nature. Beliefs related to interpersonal interaction with a cognitive emphasis (Edmondson, 1999) while behaviors focus on action. Because of this difference behaviors are hypothesized to be highly correlated with one another. Within the beliefs there are two distinct categories, as depicted in the model. Three of the beliefs (roles, goals, and team confidence) relate to task completions, while two beliefs (trust and interpersonal understanding) relate more closely to interpersonal interaction or other person's within the team. This distinction follows the task, person distinction seen in team theory (Benne & Sheets, 1948) and other theories: leadership (Blake & Mouton, 1964; Kahn & Katz, 1960) and, conflict (DeDreu & Weingart, 2003; Janssen, VanDeVliert & Veenstra, 1999). These two distinct categories of beliefs are also expected to be highly correlated within categories. That is, roles, goals, and team confidence, named task beliefs, will be highly correlated with one another. Trust and interpersonal beliefs, named interpersonal beliefs, will be highly correlated with one another.

H3a: Behaviors will be correlated to each other.

H3b: Task beliefs will be correlated to each other.

H3c: Interpersonal beliefs will be correlated to each other.

*Hypothesized Relationships Between Individual Beliefs,
Behaviors, and Performance*

Since no existing individual measures or existing individual team learning literature exists, the fourth set of hypotheses focus on establishing relationships in the model. This research argues that individuals enact the team level; therefore, the team learning relationships, expressed in the literature at the team level, will hold at the individual level. Again refer to Figure 2-2: the team learning model shown on the top is possible because of the individuals who contribute to the team learning. Therefore, it is possible to develop individual-level hypotheses based on the existing team learning literature.

Testing these hypotheses at the individual level is important for four reasons. First, documenting the relationships depicted in the model provides the necessary credibility to the model and measure as a developmental tool. Second, understanding the strength of those relationships will enhance learners' understanding of team learning and their experience. Third, testing the relationships at the individual level will affirm that it is individuals who are enacting the team learning process. Fourth, a model of individual-level relationships is created for the first time.

The following discussion builds on the discussion about the model and proposes relationships between the categories (beliefs, behaviors, performance) in the model. Hypotheses are suggested from this discussion.

Relationships Between Beliefs and Behaviors

Task shared beliefs all relate to the task: roles relate to who is qualified and should be assigned the task; goals relate to what the task should be; and team confidence relates to the team members' belief that they can accomplish the task. Coordination is the learning behavior that addresses the behavior response of teams to tasks. Druskat and Wolff (2001) suggested that mutual trust, a sense of identity, and a sense of group efficacy are the conditions for participation, cooperation, and collaboration in a team.

H4a: Task shared beliefs are positively associated with coordinating.

Interpersonal shared beliefs relate primarily with emotions and social interactions associated with different viewpoints and facing challenges. Both continuous improvement and adapting relate to these shared beliefs. These learning behaviors are concerned with making improvements and changes to existing processes and procedures or making changes due to unexpected events. Continuous improvement addresses ongoing incremental improvement, and adaptation addresses emergent needs for change. For the problem solving of adapting and continuous improvement to take place, team members must be able to question assumptions and admit mistakes (Edmondson, 1999), which happens in an environment created by interpersonal shared beliefs.

H4b: Interpersonal shared beliefs are positively associated with adapting.

H4c: Interpersonal shared beliefs are positively associated with continuous improvement.

Figure 2-3 depicts these hypothesized relationships overlaid on the model. Figure 2-4 demonstrates the relationships hypothesized at the individual level. This new model is entirely at the individual level.

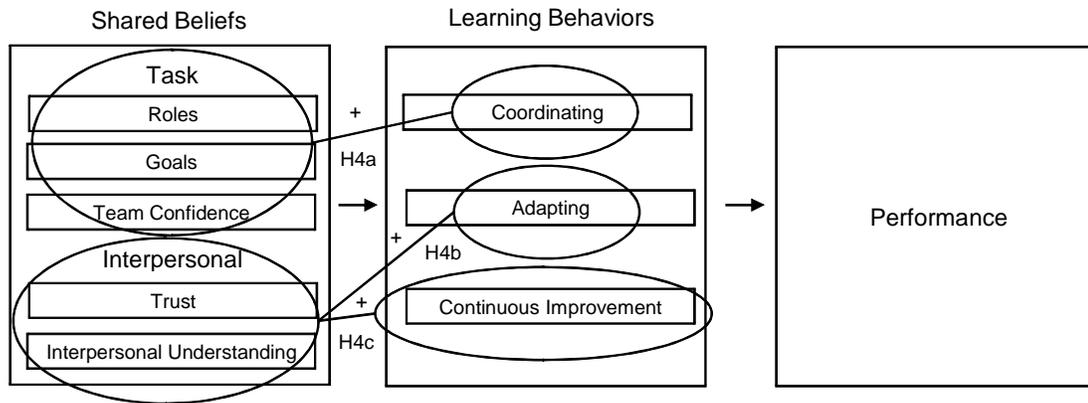


Figure 2-3. Hypotheses 4a, 4b, and 4c overlaid on the team learning model.

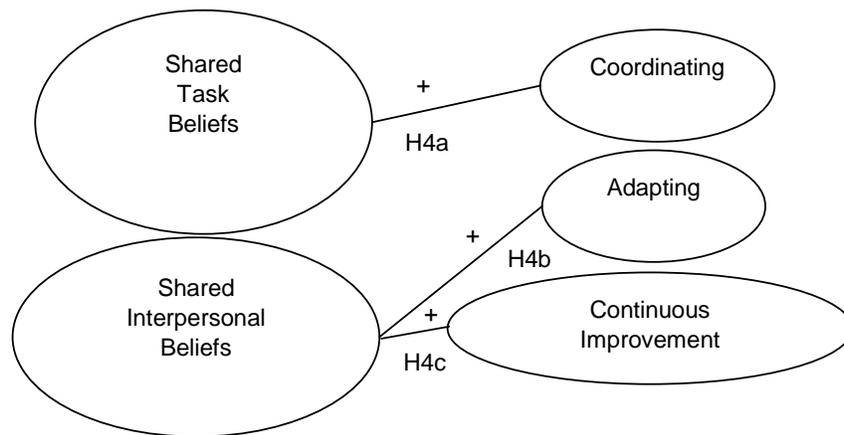


Figure 2-4. The Individual Contribution to Team Learning Model.

Relationships Between Individual Inputs, Processes, and Outputs

Studies have not shown consistency in regards to the relationship between the inputs (beliefs), processes (behaviors), and outputs (performance). This inconsistency is due in part to the use of different variables when testing each model (Edmondson et al., 2007). Mathieu, Goodwin, Heffner, Salas and Cannon-Bowers (2000) found that group processes (i.e. cooperate) fully mediated the relationship between mental models (organized knowledge structures that help make decisions) and team effectiveness. Van Der Vegt and Bunderson (2005) found that team learning behaviors mediate expertise

diversity and performance. Initially research, drawing on team effectiveness studies, supported learning behaviors as a mediator (Edmondson et al., 2007). It is expected that this mediator relationship will hold at the individual level.

H5: Shared behaviors mediate the relationship between shared beliefs and performance.

CHAPTER 3:

METHODOLOGY

The focus of this chapter was to assess the new measure, the Self-Perception of Team Learning Beliefs and Behaviors Questionnaire, and hypothesized relationships in the Individual Contribution to Team Learning Model (see Figure 2-3). The items in the measure were adapted from a preexisting, but yet to be validated, measure and were assessed for content validity by subject matter experts (SMEs). The resulting scales were administered to a population of undergraduate business school students. In order to further validate the measure and test the model, additional survey measures were administered to the same population. Details regarding the population, measures, and procedures used in this study follow.

Population and Sample

This study sought to find a developmental tool for use in the business education classroom. An undergraduate population was chosen because initial introductions to team dynamics theory and experience are often provided at the undergraduate level. Students were enrolled in one of two courses with semester-long teams (14 weeks) at a mid-Atlantic university business school. Teams were assigned by the instructor and ranged in size from 3 to 5 members, with an average team size of 4.24 and standard deviation of .96. A total of 201 students participated. The sample size satisfied the minimum of 150 suggested by Guadagnoli and Velicer (1988) to be adequate when conducting exploratory factor analysis. A demographic profile of the population is provided in Table 3-1.

Table 3-1
Population Demographics

	Total	Percentage
Gender		
Male	99	49.3
Female	95	47.3
Not Reported	7	3.5
Ethnicity		
African American	7	3.5
Asian	26	12.9
East Indian	4	2
Native American	0	0
Caucasian	130	64.7
Middle Eastern	3	1.5
Hispanic	7	3.5
Pacific Islander	0	0
Other	12	6
Not Reported	12	6
Age		
17	15	7.5
18	128	63.7
19	21	10.4
20	8	4
21	4	2
Not Reported	25	12.4

The first of the two courses was an introduction to organizational behavior course. The course consisted of a weekly lecture and an experiential lab. Student teams interacted during experiential labs and were responsible for completing a semester-long project, resulting in a paper and presentation. A total of 145 students chose to participate in this study from 30 teams. The second course was an introduction to information systems course. The course consisted of a weekly lecture and lab. Student teams worked on a semester-long project with assignments due throughout the semester. A total of 56

students chose to participate from this course.

These student teams are considered teams based on the definition of work teams as an "...interdependent collection of individuals who share responsibilities for specific outcomes..." (Sundstrom, De Meuse, Futrell, 1990, p. 121). The team members were jointly responsible for specific deliverables to the instructor. Some of these teams may have integrated their work to greater or lesser degrees. Team members receipt the same grade for the deliverables ensured joint responsibility.

Measures

Details regarding the nature of the measures, their origins, and reason for inclusion are discussed in turn.

Demographics

Demographic data, including age, gender, and race, were collected from all participants and reported in Table 3-1.

Self-Perception of Team Learning Beliefs and Behaviors Questionnaire

The individual measure developed for this study measured team members' self-perception of team learning beliefs and behaviors. It addressed eight constructs presented in the model: the five team learning beliefs (roles, goals, team confidence, trust, and interpersonal understanding) and the three team learning behaviors (coordinating, adapting, and continuous improvement). The measure included six items for each of the eight constructs, resulting in a total of 48 items. One item for each construct was reverse scored. The measure was designed to assess a specific team experience, i.e., the student

team in the class in which participants were enrolled. A detailed explanation of the item construction process, content validity, and response set follow.

Item Construction

Items were adapted from a measure developed for team leadership (Kayes & Kayes, 2007). The item sentence stems were changed from “As a team leader, I . . .” to “As a team member, I . . .” The previous measure had been used in the classroom for developmental purposes but had not been extensively tested. Careful consideration was given to item structure to ensure that the measure captured the individual’s team learning beliefs and behaviors in context to the team.

Each item was reviewed to ensure consistency with a referent-shift method of item construction. The referent-shift method is one method for item construction described by Chen, Mathieu, and Bliese (2004). It is important to understand how this method captures individual beliefs and behaviors in context of the team. Details of this method in contrast to other measures using different methods follow.

The measure that was developed in this study can be contrasted with Burch and Anderson’s (2004) development of the individual Team Selection Inventory (TSI) based on the Team Climate Inventory (TCI). Items for the TSI were constructed so that respondents were asked about their individual preferences without reference to a specific team. The individual responses to the items do not represent the individual’s contribution; they only represent the individual’s opinion about working on teams in general. These items correspond with items from the TCI that were constructed using the consensus method. In the consensus method, team members respond to items about the team. This method does not capture the individual’s contribution to the team score; rather, it captures

the individual's opinion about a specific team. In other words, existing team members responded to items in the TCI about their team without an individual component.

Although this example provides an interesting look at an individual measure about a team activity, it does not capture what is needed for the measure in this study.

The measure in this study sought to capture the individual's contribution to team learning in a specific team. It was not interested in the team member's opinion about the team, nor was it interested in the individual's preferences in general. To clearly capture the individual's contribution, referent-shift item construction was utilized.

When items are constructed using the referent-shift method (Chen et al., 2004), individual team members respond to items about themselves in context of the team. Referent shift refers to the shift from individual to the team. For example, the referent-shift method was used for collective efficacy (Chen et al., 2004) for a study. "I have real confidence in my unit's ability to perform its mission" is a sample item from the study (Jex & Bliese, 1999, p. 352). The referent shifts from "I," to "my unit." The use of the referent-shift method in this measure allows for items in the measure to be an individual's response about themselves in the context of the team.

Item Review for Content Validity

Prior to administering the measure to the population, SMEs, using the card sort method, reviewed the items in the measure to assess content validity. Each item was printed on a card. An envelope with the name and definition of each construct was provided. SMEs were asked to sort the cards into the envelope they believed each item represented. SMEs were also encouraged to write comments regarding clarity on each card.

Management professors and senior doctoral students familiar with teams were asked to act as SMEs. A total of 14 SMEs agreed to review the items. The percentage of agreement among SMEs was calculated. In addition, comments from SMEs noted on the cards were recorded on a matrix organized by construct. Review of the calculated percentage agreement reflected natural cut points, which were used to establish the degree of agreement criteria found in Table 3-2. These criteria were developed by the researcher to provide a comparison between items in the study. The criteria were not intended to be an objective standard by which items were required to be changed, however, items with weak and no agreement were all changed.

Table 3-2
Card Sort Degree of Agreement

Percent Agreement	Degree of Agreement
≥ 91%	Excellent
85-90%	Good
75-84%	Moderate
50-74%	Weak
≤ 49%	No agreement

In addition to commenting on individual items, some SMEs commented on the definitions of the constructs. These comments and the comments on individual items highlighted some general concerns. One concern was that belief items should contain only belief and not behavioral elements. Likewise, behavior items should contain only behavioral elements and no belief elements. To address these concerns, careful attention was given to ensuring that belief items reflected team members' belief, perception, understanding, or knowledge and behavior items clearly articulated a specific act or behavior. Other comments regarding construct definitions are discussed in chapter 5.

Each item was reviewed in the context of the construct it was intended to measure. When items were consistently sorted into a construct other than the one it was intended to measure, results from the two constructs were reviewed together. Literature was also reviewed to gain further insight. Based on the analysis of SMEs' comments and card sort results, 20 items were not changed, 13 received minor changes, 13 were changed, one item was moved between constructs, one item was removed, and one new item was written.

Most of the changes occurred in the behaviors. Of the items anticipated to measure beliefs, 83% were not changed or had minor changes, compared with only 44% of the behavior items. This result is not surprising, as many researchers conceptualize learning behaviors as distinct but measure them as one concept (Druskat & Kayes, 2000; Edmondson, 1999; Van den Bossche et al., 2006). Specifically, "coordinating" items were sorted into other behaviors and belief construct envelopes, resulting in revisions to coordinating items, focusing on the items clearly relating to getting work done.

Items for the other two behaviors, continuous improvement and adapting, were commonly confused with each other. Continuous improvement items were sorted as continuous improvement and adapting over 86% of the time. Adapting items were sorted as continuous improvement and adapting items over 85% of the time. In the simplest terms, continuous improvement and adapting differ in that continuous improvement seeks to improve the ongoing processes and procedures the team uses to get work done while adapting focuses on how the team responds to unexpected roadblocks that would prevent them from getting work done. Specific attention was given to this distinction while revising these items.

A sample item for each of the eight constructs is provided in Table 3-3. The measure used in the study contained 48 items, 6 for each of the hypothesized constructs with a reverse-scored item for each construct. The complete measure can be found in Appendix A. Additional details related to the card sort analysis and changes made to items are captured in the Card Sort Analysis Matrix (Appendix B).

Table 3-3
Sample Measure Items

Construct	Sample item As a team member I . . .
Team learning beliefs	
Roles	understand the unique work performed by team members.
Shared goals	believe that team members typically share a common goal.
Team confidence	believe that my team can solve any issues it faces.
Trust	believe that team members have the freedom to share different opinions.
Interpersonal understanding	know when other team members are under stress.
Team learning behaviors	
Coordinating	keep other team members informed about my work.
Adapting	take corrective action when my team faces an unexpected problem.
Continuous improvement	share my knowledge of the team's processes and procedures with other team members.

Response Set

Individuals were asked to respond to each item on a 7-point Likert scale ranging from “very accurate” to “very inaccurate.” A description was provided for each point on the measure to enhance participant interpretation of the scale (Weng, 2009). A 7-point

scale was selected over a scale with fewer responses which tend to have lower reliabilities (Weng, 2004). The study population, college students, should be able to distinguish between the scale items (Weng, 2004).

All relationships were hypothesized to be positive. In other words, performance is maximized when shared beliefs and shared behaviors are maximized. Consistent with the proposed model, a higher final score for each construct (after inverting the reverse-scored item) was considered a higher skill level for that construct.

Team Assessment: Convergent Validity Measures

A measure validated in other studies was identified for each of the eight constructs to assess the convergent validity. These additional validated measures were administered as a team assessment measure along with the newly developed measure. The validated measures for each construct and their respective constructs from the developed measure in this study were expected to be positively, but not perfectly, correlated. The existing validated measure identified for each of the eight constructs is shown in Table 3-4, including the number of items that were used. The title team assessment was given to the document with the convergent measures in order to distinguish the measures from the individual measure. The team assessment document is included in Appendix C.

The convergent validity measures also used a 7-point Likert scale. Measures for roles, goals, team confidence, interpersonal understanding, and coordinating ranged from “completely disagree” to “completely agree.” Measures for adapting, continuous improvement, and trust ranged from “very inaccurate” to “very accurate.”

Table 3-4
Convergent Validity Measures

Construct	Measure	Sample item
Team learning beliefs		
Roles	4 items (Van den Bossche et al., 2006)	When my team members succeed in their jobs, it works out positively for me.
Goals	4 items (Van den Bossche et al., 2006)	This team is united in trying to reach its goals for performance.
Team confidence	6 items (Van den Bossche et al., 2006)	This team believes it can be effective.
Trust	7 items (Edmondson, 1999)	If you make a mistake on this team, it is often held against you.
Interpersonal understanding	4 items (Hamme, 2003)	When one of us is in a bad mood, people in the group notice.
Team learning behaviors		
Coordinating	3 items (Van den Bossche et al., 2006)	Information from team members is complemented with information from other team members.
Adapting	3 items (Edmondson, 1999)	We invite people from outside the team to present information or have discussion with us.
Continuous improvement	4 items (Edmondson, 1999)	We regularly take time to figure out ways to improve our team's work processes.

Peer Assessment - Self-Report Bias

A common concern with self-report measures is the degree to which subjects may be biased. This bias can be a source of invalidity. A peer assessment measure was administered to assess the agreement between self and peer assessments for each construct to check for differences in perception. Perception differences between self and peer assessments can be assessed by comparing the peer assessment score for each construct with the individual self-perception measure score of the same construct.

An assessment item was written for each of the eight constructs, shown in Table 3-5. Students then assessed each member based on the assessment items using a 7-point Likert scale ranging from “very inaccurate” to “very accurate.” The peer assessment measure used in the study is provided in Appendix D. The individual peer assessment scores for each construct were determined by aggregating the responses of all team

members for the construct peer assessment item. A minimum of two peer assessment scores were required for an individual to be included in the analysis.

Table 3-5
Peer Assessment Items

Constructs	Item Team member name ...
Team learning beliefs	
Roles	is aware of the unique skills and abilities of other team members and agrees that tasks should be divided based on team members' strengths and weaknesses.
Shared goals	is aware of how individual team members' individual goals fit within the team goal and focuses on accomplishing the team goals.
Team confidence	is confident that the team will succeed.
Trust	believes it is acceptable to share their opinion and discuss other team members' opinions even when those opinions are unpopular or acknowledges a mistake.
Interpersonal understanding	is aware of other team members' moods, feelings, and stress levels.
Team learning behaviors	
Coordinating	accomplishes work with the team by staying up-to-date with other team members' activities, and keeping the team apprised of his/her own activity.
Adapting	responds to, and helps the team respond to, unexpected and unusual events so that the team's work still gets done.
Continuous improvement	helps the team improve how work is accomplished by evaluating and suggesting improvements to team processes and procedures.

Peer Appraisal as an Outcome Measure

To measure individual performance, peer evaluations were used—specifically, the short form used by Baker (2008) in her analysis of peer evaluations (here referred to as peer appraisal). Students working in teams over several semesters developed this peer

appraisal measure as a class assignment. The peer appraisal assesses students in four areas: (1) preparation, (2) participation and communication, (3) ability to help the team excel, and (4) being a team player. Baker's analysis showed that the appraisal measure had an interrater reliability of .80, and correlation with quiz scores was .41 ($p < .001$) (Baker, 2008).

An individual peer appraisal score for each subject was calculated by aggregation. Individuals received one score for each of the four areas from each team member. These four scores were aggregated across all team members for the individual. Individuals had to be evaluated by a minimum of two team members to be included in the analysis. A copy of the peer appraisal is provided in Appendix E.

Administration of Measures

Demographic data were collected in the first two weeks of class of the 14-week semester. The remaining survey measures (the individual measure, team assessment, peer appraisal, and peer assessment) were collected in the last two weeks of the semester. By maximizing team tenure team members will have sufficient experience with the team, including completion of at least one team assignment, to respond to the measure. All surveys were distributed in one packet to students during class, and students were asked to return completed surveys in the subsequent class. Students were verbally reminded, in addition to the written instructions, to complete the surveys in reference to their experience in their semester-long team. The surveys took approximately 15 to 20 minutes for students to complete. The survey packet included the research study consent form. Students were assured confidentiality.

Data Analysis

All measure data were analyzed using the SPSS Statics GradPack 17.0. Specific methods are discussed in conjunction with their corresponding section in the results. The population size is noted for each analysis. In some cases the population is less than the 201 total participates. This reduction is due to individuals who decline participation in the team assessment, did not have peer assessments scores from at least two team members or did not have complete peer appraisals from at least two team members.

CHAPTER 4:

RESULTS

This chapter addresses the five hypotheses outlined in chapter 2, examining study results under three headings: testing of the measure, testing of the model, and exploration of the results.

Testing of the Measure

Content Validity

When developing the measure, subject matter experts reviewed the items for content validity, as described in chapter 3.

Factor Analysis and Reliability (Hypotheses 1 and 2)

The individual measure was assessed determine which constructs met criteria for internal consistency and reliability. Factor analysis was conducted first to assess factor structures. Resulting factors were assessed with Cronbach's alpha (Cronbach, 1951) to assess reliability. Only those factors with strong internal consistency and acceptable reliabilities were retained in the study. Details of criteria and factor and reliability analyses of the three resulting constructs follow.

Factor Analysis

Exploratory factor analysis is typically used to test how and to what extent items relate to the hypothesized constructs. Exploratory, rather than confirmatory, factor analysis allows for factors to load according to the data rather than the hypothesized structure. Although there is some knowledge about the relationships being measured, this

is the first time these specific items have been tested; therefore, exploratory factor analysis was used.

Eigenvalues were calculated to assess the nature and number of factors in the measure. Varimax factor rotation, the most common method, was used to help interpret the meaning of the factors. Varimax rotation attempts to maximize dispersion of the loadings within factors, loading smaller variables highly onto each factor. Items for each construct were included if the factor loading was greater than .50 on one factor and less than .369 on a second factor. The lower bound of .369 was selected based on critical values of correlation coefficients with a sample size of 201 (Stevens, 2002). The rotation converged after 22 iterations. The three factors retained in the study accounted for 36% of the variance. A total of 30 items were dropped. Table 4-1 includes the 18 items retained and the factors that they loaded to.

Continuous Improvement and Adapting. Review of the factor loadings for the first factor using the criteria above indicated a factor with nine items, four anticipated to measure continuous improvement and five anticipated to measure adapting. The results seem to confirm what the card sort analysis had already demonstrated: that the proposed continuous improvement and adapting constructs were closely related.

Review of the items in factor 1 led to the creation of a new construct that described the degree to which the team members reviewed the work accomplished, suggested and took corrective action, and helped other team members. This summary drew on elements of continuous improvement and adapting; therefore, the construct is named continuous adaptive learning (CAL).

Table 4-1
Factor Analysis of Individual Measure (n = 201)

Number. Item – intended measure	Factors		
	Continuous Adaptive Learning	Team Confidence	Interpersonal Understanding
48. suggest ways for the team to improve. – continuous improvement	.76	.18	.06
47. discuss how the team should respond to team set backs when they occur. - adapting	.72	.20	.15
32. regularly review how the team accomplishes work.- continuous improvement	.63	.27	.12
40. suggest improvement to team processes and procedures.- continuous improvement	.62	.10	.11
27. take corrective action when my team faces an unexpected problem. – adapting	.60	.07	.14
39. know what to do if something unusual goes wrong. – adapting	.60	.33	.26
36. correct possible mistakes before they happen. – continuous improvement	.56	.22	.22
31. help the team with unexpected team issues.- adapting	.54	.16	.07
43. step in when other team members encounter an unexpected problem. – adapting	.52	.07	.13
33. am confident that my team will perform well. – team confidence	.08	.86	.05
37. believe that my team will be successful. – team confidence	.19	.83	.04
45. believe that my team will perform better than other teams. – team confidence	.20	.79	.11
29. know that my team can accomplish anything. – team confidence	.14	.78	.10
41. believe that my team can solve any issues it faces. – team confidence	.21	.74	.13
6. know when a team member is having a bad day. – interpersonal understanding	.05	.07	.83
10. know when other team members are under stress. – interpersonal understanding	.16	.11	.78
22. recognize when a team member is in a bad mood. – interpersonal understanding	.07	.08	.78
14. am aware of the feelings and moods of team members during meetings. – interpersonal understanding	.28	.03	.63
Eigenvalues	11.66	2.98	2.72
% of Variance	24.31	6.20	5.68
α	.88	.90	.81

Confidence. The second factor contained five of the six items anticipated to measure team confidence. The sixth item that was not included was the reverse-scored item. This factor was retained without the reverse-scored item. In line with the reference shift item construction, this factor represents the individual's confidence in the team.

Interpersonal Understanding. The third factor contained four of the six items anticipated to measure interpersonal understanding. One of the two items dropped was the reverse-scored item. This construct was retained without the two dropped items. Interpersonal understanding refers to the individual's awareness of the mood and stress level of other team members.

Reliability

Reliability of factors was assessed using Cronbach's alpha (Cronbach, 1951) to determine whether the internal consistency met the minimum acceptable level of alpha .70. Each of the three retained items met the minimum level. The coefficient alpha of CAL was .88, team confidence was .90, and interpersonal understanding was .81.

Review of Hypotheses 1a to 1f

These analyses address the first set of hypotheses, which hypothesized that the measure would be an eight-construct measurement model. Specifically a hypothesis for each construct hypothesized that the items related to each construct would be internally consistent. H1a (roles), b (goals), d (trust), and f (coordinating) were not supported, and all items for these hypothesized constructs were dropped. H1c (team confidence), e (interpersonal understanding), i (adapting), and j (continuous improvement) were all partially supported, with some items being dropped and others being combined, resulting in the three constructs discussed above. A total of 18 items were retained.

Review of Hypothesis 2

Hypothesis 2, regarding the interrelatedness of items in the constructs, was tested using the three constructs of team confidence, interpersonal understanding, and CAL, that resulted from the previous analysis. Alphas are reported on the diagonal in Table 4-2 along with intercorrelations and descriptive statistics of the study variables. As shown in the table, the alphas for each construct were greater than its correlation with either of the other two constructs, supporting Hypothesis 2, that items within construct would be more highly interrelated than items between construct.

Table 4-2
Mean, Standard Deviation, Internal Consistency Reliabilities, and Intercorrelations Among Study Variables (n = 201)

	Mean	SD	Team confidence	Interpersonal understanding	Continuous adaptive learning
Team confidence	5.67	0.78	(.90)		
Interpersonal understanding	5.68	1.01	.20**	(.81)	
Continuous adaptive learning	5.30	0.97	.43**	.35**	(.88)

** . Correlation is significant at the 0.01 level.

() Diagonal entries are coefficient alpha reliabilities estimates. SD standard deviation.

Relationships Among Construct Groups (Hypothesis 3)

The model presented in this study includes beliefs and behaviors. Within beliefs, two distinct categories, task and interpersonal beliefs, were proposed. The constructs within their respective groups were anticipated to be highly related with one another (Hypothesis 3). Only one task belief (team confidence), one interpersonal belief (interpersonal understanding), and one behavior (CAL) resulted from the factor analysis. Since there were not multiple constructs within the categories, relationships between them, as hypothesized in Hypothesis 3, could not be tested.

Convergent Validity

Existing validated measures selected to test for convergent validity were expected to be highly correlated with the corresponding construct. Correlations between the three constructs in the measure (team confidence, interpersonal understanding, and CAL) and their related convergent validity measures are presented in Table 4-3 along with the alphas for each construct. As expected, both team confidence and interpersonal understanding were significantly correlated with their respective convergent validity measures. Team confidence and its convergent measure had a correlation of .67 with a significance level of $P < .01$, and interpersonal understanding and its convergent measure had a correlation of .34 with a significance level of $P < .05$.

Table 4-3
Correlation Matrix — Constructs with Measures for Convergent Validity (n = 193)

	Peer Assessment Measure				
	Team confidence	Interpersonal understanding	Coordinating	Adapting	Continuous improvement
Team confidence	.18*				
Interpersonal understanding	.04	.08			
Continuous adaptive learning	.12	.11	.25**	.19*	.13

*. Correlation is significant at the 0.05 level. **. Correlation is significant at the 0.01 level.

The convergent validity of CAL was tested against the three anticipated learning behavior convergent measures: coordinating, adapting, and continuous improvement. CAL was significantly correlated with convergent measures for continuous improvement and coordinating. It was not, however, significantly related to adapting. The alpha for the adapting convergent measure was very low, likely explaining why there was not a significant relationship. In addition, the items for the convergent measure of adapting

captured only a portion of how adapting was conceptualized in this study, providing further explanation for the lack of correlation.

Correlation of Measure with Peer Assessment

One of the common concerns with self-report measures is the degree to which an individual’s bias may influence his or her response. Students were asked to assess other team members specifically regarding each of the proposed constructs. The correlations between the three constructs identified by the factor analysis of the self-perception measure (team confidence, interpersonal understanding, and CAL) along with the peer appraisal for team confidence, interpersonal understanding, and the anticipated three learning behaviors are provided in Table 4-4.

The results were mixed. The correlations between the self and peer evaluations of interpersonal understanding were not significant; however, the correlation between self and peer assessment of team confidence was significant ($P < .05$), with a correlation of .18.

Table 4-4
Correlation Matrix — Self-Reported Constructs with Peer Assessment (n = 159)

	Peer Assessment Measure				
	Team confidence	Interpersonal understanding	Coordinating	Adapting	Continuous improvement
Team confidence	.18*				
Interpersonal understanding	.04	.07			
Continuous adaptive learning	.12	.11	.25**	.19*	.13

*. Correlation is significant at the 0.05 level. **. Correlation is significant at the 0.01 level.

Students' self-assessment of their CAL was reviewed in light of their peers' assessment of the three anticipated learning behaviors: coordinating, adapting, and continuous improvement. A significant correlation of .19 was found between self CAL and adapting ($P < .05$) and a significant correlation of .25 was found between self CAL and coordinating ($P < .01$). The correlation between self CAL and peer assessment of continuous improvement was insignificant.

Summary

Analysis of the psychometric properties of the developed measure, which included a content validity check through a card sort analysis, resulted in three constructs with acceptable alphas. The three constructs were team confidence, a task belief; interpersonal understanding, an interpersonal belief; and CAL, a learning behavior. Items within these constructs were found to be more highly correlated than items between constructs.

There was agreement between students' self and peer assessment regarding their individual contribution to team confidence and some elements of team learning. Peer and self perceptions of interpersonal understanding differed.

The analysis provided sufficient support, in the strong alphas and convergent validity, to move forward with testing the model with the three identified constructs. A correlation matrix of all variables in this study is provided Table 4-5.

Table 4-5
Correlation Matrix

	Mean	SD	Team confidence	Interpersonal understanding	Continuous adaptive learning	Group Potency (Van den Bossche et al., 2006)	Interpersonal Understanding (Hamme, 2003)	Co-Construction - Coordinating (Van Den Bossche et al., 2006)	Team Learning - Adapting (Edmondson, 1999)	Team Learning - Continuous Improvement (Edmondson, 1999)	Peer assessment - Team confidence	Peer assessment - Interpersonal understanding	Peer assessment - Coordinating	Peer assessment - Adapting	Peer assessment - Continuous improvement	Performance
Team confidence	5.68	1.01	(.90)													
Interpersonal understanding	5.30	.97	.20 ^{**}	(.81)												
Continuous adaptive learning	5.67	.78	.43 ^{**}	.35 ^{**}	(.87)											
Group Potency (Van den Bossche et al., 2006)	5.91	.97	.67 ^{**}	.03	.35 ^{**}	(.96)										
Interpersonal Understanding (Hamme, 2003)	4.11	.96	.35 ^{**}	.34 ^{**}	.26 ^{**}	.32 ^{**}	(.55)									
Co-Construction - Coordinating (Van Den Bossche et al., 2006)	5.89	.93	.42 ^{**}	.00	.25 ^{**}	.59 ^{**}	.30 ^{**}	(.85)								
Team Learning - Adapting (Edmondson, 1999)	3.71	1.14	.09	.16 [*]	.11	.08	.24 ^{**}	.13	(.37)							
Team Learning - Continuous Improvement (Edmondson, 1999)	5.25	1.09	.51 ^{**}	.12	.47 ^{**}	.58 ^{**}	.35 ^{**}	.49 ^{**}	.26 ^{**}	(.84)						
Peer assessment - Team confidence	5.80	1.40	.18 [*]	.05	.12	.21 ^{**}	.01	.15	-.10	.14	1					
Peer assessment - Interpersonal understanding	5.65	.95	.24 ^{**}	.08	.11	.26 ^{**}	.14	.22 ^{**}	.07	.21 ^{**}	.48 ^{**}	1				
Peer assessment - Coordinating	5.86	1.05	.14	.16 [*]	.25 ^{**}	.10	.12	.07	.01	.08	.57 ^{**}	.68 ^{**}	1			
Peer assessment - Adapting	6.02	.99	.13	.15	.19 [*]	.07	.10	.06	-.04	.07	.62 ^{**}	.71 ^{**}	.89 ^{**}	1		
Peer assessment - Continuous improvement	5.55	1.61	.90	.07	.13	.09	.01	.07	-.12	.06	.90 ^{**}	.49 ^{**}	.69 ^{**}	.69 ^{**}	1	
Performance	3.54	.58	.11	.14	.20 [*]	.16 [*]	.09	.14	-.02	.10	.30 ^{**}	.63 ^{**}	.73 ^{**}	.71 ^{**}	.38 ^{**}	1

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

() Coefficient alpha reliabilities estimates.

Testing of the Model

The results of the above analysis required revision of the model to include only those constructs resulting from the factor analysis. The revised model of team learning is depicted in Figure 4-1. This model contained only three constructs: the task and interpersonal categories of beliefs each had one belief instead of multiple beliefs—team confidence and interpersonal understanding, respectively. The revised model had only one team learning behavior—CAL—rather than three.

The relationships between the categories of constructs in the model are captured in Hypotheses 4 and 5, creating the Individual Contribution to Team Learning Model. As the above analysis resulted in only one task belief, one interpersonal belief, and one learning behavior, these hypotheses could not be tested as originally articulated. However, on a post hoc basis, the same pattern of relationships hypothesized could be tested for the constructs that remained. For example, the hypothesis regarding task shared beliefs, originally including three constructs, could simply be tested with team confidence.

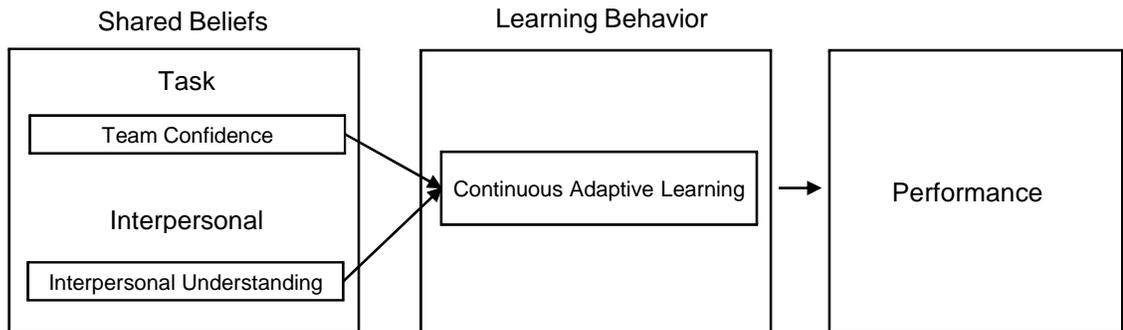


Figure 4-1. Revised process model of team learning.

Relationships in the Model: Post Hoc Analysis

Hypothesis 4 suggested a positive relationship between beliefs and behaviors. These relationships were tested using hierarchical linear regressions. Hypothesis 5 suggested that learning behaviors mediate the relationship between learning beliefs and performance. The mediation relationship was tested using the procedures suggested by Baron and Kenny (1986). A significance level of alpha .05 was used in the analysis. Analysis was conducted with demographic variables to ensure the robustness of the model.

Prior to conducting hierarchical regression analysis, the independent and dependent variables were assessed for normality, one of the assumptions of regression analysis. A review of histograms of the data revealed that the data were moderately skewed in a positive direction. Further analysis of the statistics for skewness, kurtosis, and the Kolmogorov-Smirnov test with a Lilliefors significance level confirmed this assessment. When conducting the regression analysis, the Durbin-Watson test of serial correlation in the residuals of the regression analysis was assessed. The histogram of standardized residuals was also assessed to test the assumption of normality in the error term. These analyses of residuals did not reveal any concern for normality. Specific results of the regression analysis are described below.

Table 4-6 shows the results of the regression model where CAL is the dependent variable and the team learning belief is the independent variable. In all, three models were tested. The control variables, ethnicity and gender, were entered in the first step for all models. The second step of each model included either or both of the independent variables, interpersonal understanding and team confidence. Interpersonal understanding

was the independent variable in the first model, and team confidence was the independent variable in the second. The third model included both independent variables in step 2.

Table 4-6
Regression Model of Continuous Adaptive Learning (n = 192)

Variable	Model 1					Model 2					Model 3				
	B	SE B	β	R ²	ΔR^2	B	SE B	β	R ²	ΔR^2	B	SE B	β	R ²	ΔR^2
Step 1				.01					.01					.01	
(Constant)	5.71	.09				5.7	.09				5.72	.09			
Control Variables															
Ethnicity	.13	.26	.04			.13	.26	.04			.13	.26	.04		
Gender	-.06	.12	-.04			-.06	.12	-.04			-.06	.12	-.04		
Step 2				.14**	.13**				.20**	.19**				.27**	.26**
Interpersonal understanding	.30	.06	.37**								.29	.05	.38**		
Team confidence						.34	.05	.44**			.22	.05	.28**		

* Significant at the 0.05 level. ** Significant at the 0.01 level.

B, unstandardized coefficient; SE B, standard error of the unstandardized coefficient; β , Beta, standardized coefficient
R², r-squared; ΔR^2 , change in r-squared

The main effects of interpersonal understanding ($\beta = .37, P < .01, R^2 = .14, \Delta R^2 = .13$) and team confidence ($\beta = .44, P < .01, R^2 = .20, \Delta R^2 = .19$) were both positive and accounted for significant incremental variance in CAL beyond that accounted for by the control variables. Team confidence accounted for more variance than did interpersonal understanding. Model 3 including both independent variables was also significant ($\beta = .28, P < .01, R^2 = .27, \Delta R^2 = .26$).

Table 4-7 shows the results of the regression models when performance was the dependent variable and team learning beliefs and behaviors were independent variables. In all, four models were tested. The control variables, ethnicity and gender, were entered in the first step for all models. The second step included one or all of the learning beliefs and behaviors as independent variables. In the first model, the independent variable was

interpersonal understanding; in the second, team confidence; and in the third, CAL. The fourth model included all three of the independent variables.

Table 4-7
Regression Model of Performance ($n = 158$)

Variable	Model 1					Model 2					Model 3					Model 4				
	B	SE B	β	R^2	ΔR^2	B	SE B	β	R^2	ΔR^2	B	SE B	β	R^2	ΔR^2	B	SE B	β	R^2	ΔR^2
Step 1				.05	.05				.05	.05				.05	.05				.05	.05
Control Variables																				
Step 2				.07	.01				.07	.01				.09	0.04*				.09	.04
Interpersonal Understanding	.07	.05	.12													.03	.05	.05		
Team Confidence						.07	.05	.12								.02	.06	.03		
Continuous Adaptive Learning											.14	.06	.19*			.12	.07	.16		

* Significant at the 0.05 level. ** Significant at the 0.01 level.

B, unstandardized coefficient; SE B, standard error of the unstandardized coefficient; β , Beta, standardized coefficient
 R^2 , r-squared; ΔR^2 , change in r-squared

The main effects of interpersonal understanding ($\beta = .12$, $P = .15$, $R^2 = .07$, $\Delta R^2 = .01$) and team confidence ($\beta = .10$, $P = .16$, $R^2 = .08$, $\Delta R^2 = .01$) were both not significant, indicating that neither of the learning beliefs provided incremental variance in performance beyond that accounted for by the control variables. The effects of team learning beliefs and behaviors (model 4) were also not significant ($\beta = .16$, $P = .09$, $R^2 = .09$, $\Delta R^2 = .04$). The main effect of CAL in model 3 showed mixed results: the model ($R^2 = .09$, $P = .07$) was not significant, while CAL ($\beta = .19$, $P < .05$, $\Delta R^2 = .04$) was independently significant, providing support for incremental variance in performance beyond that accounted for by the control variable.

Hypothesis 5 suggested that team learning behaviors mediated the relationship between team learning beliefs and performance. There are four steps included in the procedures suggested by Baron and Kenny (1986) to test for mediation. The first step

requires that the relationship hypothesized to be mediated exists. In this case that relationship is between team learning beliefs and performance. The analysis above does not support this relationship. No further steps need to be completed to determine that there is no mediation.

Summary

The results of this study support a model of team learning that includes two beliefs and one learning behavior. The impact on performance was unclear, as there were mixed results. Figure 4-2 represents the model with the relationship supported by the regression analysis. This model demonstrates the team learning beliefs and behavior relationships at the individual level. Past research demonstrated relationships between team learning behaviors and team confidence (Edmondson, 1999; Gibson, 1999; Van den Bossche et al., 2006) and interpersonal understanding (Druskat & Kayes, 2000).

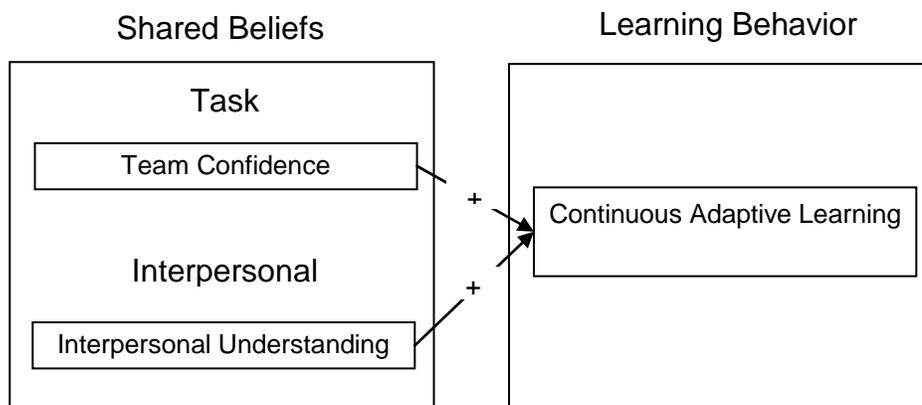


Figure 4-2. Model of study results.

Exploration of the Results

Exploratory analysis of the results related to the distinction between team learning behaviors and the insignificant results with the performance outcome measure may be helpful. Development of measure is typically an iterative process. In this first step the distinction between the three learning behaviors was not realized. Identifying next steps in the development process would benefit from a closer look at the factor structure and reliability of the behavior items. Regression analysis between learning beliefs or behaviors and the performance outcome measure were mixed. This is surprising as many past studies have found significant results (Druskat & Kayes, 2000; Edmondson, 1999; Kasl, Marsick, & Dechant, 1997; Kayes, Kayes, & Kolb, 2005; Van den Bossche, et al., 2006). The performance measure used in this study was an aggregate of multiple performance areas. Review of these areas individually may provide insight into the mixed results. Additional exploratory analysis of the behavior items and the performance areas follow.

Team Learning Behaviors

This study was interested in distinguishing between three learning behaviors, but team members in this study did not make the anticipated distinction. For exploratory purposes, a closer look was taken of just the items anticipated to measure the three team learning behaviors in this study. Factor analysis and reliability analysis was conducted using the same process and criteria as the prior analysis. However, since this was exploratory analysis, when assessing factor loadings items continued to be retained in a factor if they contributed positively to the alphas for each construct and the factor loaded on or near the .50/.30 limit used previously.

Initially, all 18 items anticipated to measure learning behaviors were assessed. Eigenvalues resulting from exploratory factor analysis using varimax factor rotation revealed one strong factor that included items anticipated to be continuous improvement and adapting items. In addition, eigenvalues suggested other factors; however, none of them met the minimum acceptable Cronbach alpha of .70 (Cronbach, 1951). One of these suggested factors included the reverse-scored item from each of the learning behaviors.

Again for exploratory purposes, eigenvalues were calculated for just the anticipated team learning behavior items without the reverse-scored items. In addition, the two items measuring tacit behavior were excluded, as neither of the items appeared to positively contribute to any factors. Often student teams perform work independently and may have little opportunity to work side by side in ways that may facilitate working together tacitly. This analysis suggests two factors with acceptable alphas (see Table 4-8).

Seven items in the first factor had factor loadings greater than .50. As with the other analyses, the first factor includes items anticipated to measure adapting and continuous improvement. The second factor had four items with factor loadings greater than .50 and less than .30 on the next factor. The first three of these items were all anticipated to measure coordinating (The other items initially anticipated to measure coordinating were reverse-scored and tacit items that were not included in the analysis.). The fourth item was not theoretically related and was not included in the factor. The remaining three items in the factor captured the team member's effort to keep other members up-to-date on the status of their work while remaining up-to-date on the status of the work of other team members. The first factor in this analysis had a reliability coefficient alpha of .87. The second item had a coefficient alpha of .71.

Table 4-8
Factor Analysis of Team Learning Behavior Items

Number. Item – intended measure	Factors	
	1	2
47. discuss how the team should respond to team set backs when they occur. - adapting	.81	.18
36. correct possible mistakes before they happen. – continuous improvement	.75	.09
39. know what to do if something unusual goes wrong. – adapting	.73	.28
27. take corrective action when my team faces an unexpected problem. – adapting	.70	.28
48. suggest ways for the team to improve. – continuous improvement	.69	.32
31. help the team with unexpected team issues.- adapting	.59	.34
32. regularly review how the team accomplishes work.- continuous improvement	.58	.41
42. stay up-to-date on the status of other team member's work - coordinating	.14	.79
38. coordinate my work with other team members. - coordinating	.23	.78
26. keep other team members informed about my work. - coordinating	.22	.62
40. suggest improvement to team processes and procedures. - continuous improvement	.44	.58
28. share my knowledge of the team's processes and procedures with other team members. - continuous improvement	.18	.50
43. step in when other team members encounter an unexpected problem. – adapting	.44	.48
Eigenvalues	5.79	44.55
% of Variance	1.18	9.04
α (items with bolded factor loadings included)	.87	.71

Performance Measure

It was anticipated that individual peer-evaluated performance would be associated with team learning beliefs and behaviors similar to the team-level analysis. One of the unique elements of this performance measure is that it is the aggregate of four areas of

individual performance: (1) preparation, (2) participation and communication, (3) ability to help the group excel, and (4) being a team player. Rather than aggregating the performance areas, the following analysis considers each area individually to assess whether or not team learning beliefs and behaviors related to the performance areas differently.

Hierarchical regression analysis was conducted with each of the four performance areas as the dependent variable. The control variables of ethnicity and gender were entered in the first step for all analyses. In the second step, CAL was entered as the independent variable. Table 4-9 show the results of the analysis with the dependent variable identified at the top of each column.

The main effects of CAL on “being a team player” ($\beta = .12, P = .13, R^2 = .07, \Delta R^2 = .01$) and “preparation” ($\beta = .16, P = .05, R^2 = .08, \Delta R^2 = .02$) both failed to reach significance. “Preparation”, however, was just at the cutoff for significance of $P < .05$. The main effects of CAL on “ability to help the group excel” ($\beta = .22, P < .05, R^2 = .12, \Delta R^2 = .05$) was significant, accounting for significant incremental variance in the “ability to help the group excel” performance area beyond that accounted for by the control variables. Results were mixed for the dependent variable of “participation and communication”. The model ($R^2 = .09, P = .09$) was not significant. However, CAL independently ($\beta = .21, P < .01$) and the change in R^2 ($\Delta R^2 = .04, P < .01$) were both significant, indicating an independent relationship between CAL and the performance area of “participation and communication”.

Table 4-9
Regression Model of Each Performance Area (n = 158)

Variable	DV: Being a team player					DV: Ability to help group excel					DV: Participation & communication					DV: Preparation				
	B	SE B	β	R ²	ΔR^2	B	SE B	β	R ²	ΔR^2	B	SE B	β	R ²	ΔR^2	B	SE B	β	R ²	ΔR^2
Step 1				.06	.06				.07	.07				.04	.04				.05	.05
(Constant)	3.58	.064				3.47	.08				3.50	.07				3.50	.073			
Control variables																				
Ethnicity	.13	.19	.05			.15	.24	.05			.05	.22	.02			-.03	.22	-.01		
Gender	.12	.09	.11			.20	.11	.14			.10	.10	.08			.14	.10	.11		
Step 2				.07	.01				.12*	.05**				.09	.04**				.08	.02
Continuous adaptive learning	.08	.06	.12			.19	.07	.22**			.17	.06	.21**			.13	.06	.16		

* Significant at the 0.05 level. ** Significant at the 0.01 level.

B, unstandardized coefficient; SE B, standard error of the unstandardized coefficient; β , Beta, standardized coefficient
R², r-squared; ΔR^2 , change in r-squared

Summary

Developing a model and measure is an iterative process. This exploratory analysis reflects the first few steps in determining how to proceed in the development process. Exploratory analysis of the learning behavior items in the measure revealed that the learning behavior of coordinating may be present without the conceptualization including tacit learning behaviors. Review of each of the four performance areas revealed that different performance measures were impacted differently by learning behaviors. The analysis of both the learning behaviors and the performance measures indicated the need for further refinement. The implication of this analysis is discussed further in chapter 5.

CHAPTER 5:

DISCUSSION AND FUTURE RESEARCH

This study set out to assess a model and a measure intended to be a tool for students to develop team learning skills. The analysis of the measure resulted in only one supported task belief, one interpersonal belief, and one learning behavior (continuous adaptive learning, CAL) from the proposed model. Relationships between these constructs were also supported; however, their hypothesized relationships with performance were not supported. The results of this study shed some light on the disconnect between creating an environment in the classroom similar to industry. Although these results are disappointing, they are a first step in furthering the objective of a developmental measure and model for the business education classroom and distinguishing between team characteristics in classroom teams and industry teams.

The study results and recommendations for future research are discussed in three primary areas: 1) the impact of team context and characteristics on individual team learning beliefs and behaviors as seen in this study; 2) insights gained from the resulting model of individual team learning beliefs and behaviors; and 3) performance measure differences in the context of individual team learning behaviors. A few additional considerations are noted, followed by the study limitations.

Team Context and Characteristics and Individual Team Learning Beliefs and Behaviors

This study intentionally chose the undergraduate business school population in an effort to assess a model and measure of team learning in that specific context. Since one goal of teams in the classroom context is to prepare students for the business context,

industry-developed theory was used. The results of the study, retaining only three of the suggested eight constructs, demonstrate that the differences between classroom and industry teams are significant and must be addressed directly when establishing a measure and model. Contextual items may include such things as the degree to which the task was defined for the team, the length of team tenure, and the level of coaching provided. Teams may also be influenced by team characteristics such as the degree of established processes and procedures or team type. These team contexts and characteristics vary between and within the classroom and industry teams. The classroom team in this study can be considered a short-term project team. The teams were formed at the beginning of a semester; they completed a defined project and then disbanded at the end of the semester.

The results of the analysis of the measure and model in this study are discussed in light of these team contexts and characteristics. It is important to note that this study used an individual measure related to a team process. The measure asks individuals to respond to items regarding their beliefs and behavior related to the team as a way to assess their contribution to the team's shared beliefs and behavior.

Beliefs

Five beliefs were hypothesized in the measure. Roles, goals, and team confidence were identified as task beliefs, and trust and interpersonal understanding were identified as interpersonal beliefs. Only the team confidence and interpersonal understanding constructs were supported after reliability analysis.

Most likely, roles, goals, and trust were not retained as shared beliefs due to the team context and/or characteristics. Student teams in this study were short-term project

teams in which the project was defined for the team, with minimal changes during the semester. The teams received one grade for their team projects, although students received individual grades for their performance in the class. Team members needed the team only to the extent that they accomplished the team task at a level acceptable to them for their individual course grade.

Specifically, team members' perceived need to further define their goal or assess how individual goals (i.e., related to the final grade) may have differed were probably limited by the predefined task provided by the instructor. Likewise, students' goal to accomplish the instructor-assigned task within the timeframe of the semester may have limited the development of shared beliefs around roles. Team members probably found it most effective to assign roles in the most equitable way possible or to whoever volunteered first rather than considering the unique skills of each member, which is more time consuming.

The perception that there was a need for trust among team members was limited by the knowledge that the team would be disbanded at the end of the semester. Trust as conceptualized in this study indicates a climate where mistakes can be articulated and alternative views voiced without fear of repercussions. Team members may have found it more efficient and effective, in the short term, to do the work themselves and correct mistakes made by other members rather than take the time and effort required to address issues in the team. Likewise, agreeing to the first plan of action that would suffice to meet the goal would be easier than taking on a controversial position that may create problems for the short-term team.

The same team contexts and characteristics (i.e., instructor-provided goal, short-term, etc.) that helped explain why beliefs were not retained also provide insight into why the two beliefs of team confidence and interpersonal understanding were retained. Interpersonal understanding measures the degree to which team members are aware of other members' stress levels and moods. Developing an understanding of team members' moods and when they are having a bad day is important to a short-term team focused on accomplishing its goal. By being sensitive to other members' moods, students can avoid conflict, allowing the team to focus on working together and exhibiting team learning behaviors. Team confidence has long been shown in the literature to support teamwork. It is not surprising that when individual team members believe in the team, the team exhibits more team learning behaviors.

Behaviors

This study was particularly interested in distinguishing between three learning behaviors. Team learning behaviors were anticipated to distinguish between coordinating (getting work done), adapting (responding to the unexpected), and continuous improvement (revising processes and procedures). Analysis resulted in one learning behavior, CAL, which measured, the degree to which the team members reviewed the work accomplished, suggested and took corrective action, and helped other team members. Team members did not distinguish between responding to unexpected problems (adapting) and revising processes and procedures (continuous improvement). As a short-term project team, teams may not have been able to establish processes and procedures well enough that there was sufficient time to then review those processes and procedures. Instead, any change in how work was done—whether in response to work not

getting done or because of an unexpected issue—was viewed similarly. These changes to how work got done were stronger than elements of coordination related to keeping members up-to-date about work being accomplished and accomplishing tasks tacitly.

Exploratory analysis of the three learning behaviors further supported the view that student teams saw continuous improvement and adapting very similarly, as discussed above. It also revealed the lack of tacit learning behaviors. Students presumably relied on organizing work that was done independently and articulating those expectations rather than relying on intuitive work processes. This may have been further impacted by the lack of developed processes and procedures discussed above. Tacit learning may be an element of team learning that only develops over time or it may also be that the development of tacit learning requires clear processes and procedures or team members working side by side. Exploratory analysis also revealed the possibility of a second learning behavior in the context of classroom teams: coordinating, without tacit behavior.

The results in this study may not be true for all student populations or short-term teams. Student teams that are required to create a team contract that includes goals, procedures, and roles may produce an entirely different result. It is clear, however, that the context of the team is an important factor in determining the team learning beliefs and behaviors that team members develop.

In light of this discussion, three recommendations are made. First, team learning beliefs need to be explored in different team contexts and characteristics to determine how these differences impact the presence of team learning beliefs and their relationship with team learning beliefs and performance. Second, research needs to consider different team contexts and characteristics that may impact the presence of different team learning

behaviors and their relationships with team learning beliefs and performance. Specifically, research should consider coordinating learning behaviors independently from tacit learning behaviors. Also, research should consider if the degree to which processes and procedures are developed on a team impacts the team's ability to distinguish between continuous improvement and adapting. There may be five learning behaviors: (1) coordinating, without the tacit element as presented in this study; (2) tacit coordinating, for teams with specific team contexts and characteristics; (3) adapting, when teams have well-defined processes and procedures; (4) continuous improvement, when teams have well-defined processes and procedures; and (5) CAL, a combination of adapting and continuous improvement, when teams do not have well-defined processes and procedures.

These recommendations to consider team contexts and characteristics are not intended to move away from the individual developmental model and measure focused on transferable skills. Rather, the goal of the recommendations is to help determine how learning beliefs and behaviors may differ based on these team contexts and characteristics. This understanding may lead to a better understanding of how to establish team experiences in the classroom that more closely resemble industry. It may also lead to complementary measures and models based on team characteristics and contexts. Research may consider contextual items such as the degree to which tasks are defined for the team, team tenure, and level of coaching. Team characteristics may include the degree of established processes and procedures or team type.

Third, it is recommended that the definitions of learning beliefs and behaviors in future studies be clarified in light of the card sort analysis. In addition to comments on

individual items, some subject matter experts commented on the definitions. These comments and the comments on individual items highlighted some general concerns, specifically, that belief items and definitions should contain only belief and no behavioral elements and that behavior items and definitions should contain only behavioral elements and no belief elements. This concern was already addressed at the item level in this study. Here it is recommended that this concern also be addressed at the construct level in future research by ensuring that belief descriptions begin with “the degree to which team members . . . share the perception/understand/know . . .” and behavior descriptions begin with “team member’s ability to . . .” Definitions of the beliefs and behaviors should use similar language, with perception, understanding, and knowledge for beliefs and ability for behaviors. The intent is not to change the conceptualization of the construct but rather to simplify and clarify definitions and descriptions. Appendix F includes definitions and descriptions for each of the eight original constructs. The definitions provide a succinct definition of team members’ beliefs and behaviors. The descriptions expand the definition to include examples and further detail. Again, these descriptions consider the model at the team level. It is understood that at the individual level, as in this study, the individual member contributes to the group level, as described in chapter 2 and with the referent-shift item construction in chapter 3.

Relationships Between Individual Team Learning Beliefs and Behaviors

Overall, the resulting model (Figure 4-2) confirms relationships between team learning beliefs and behaviors at the individual level and provides insight for instructors. The model confirms that the relationship between team learning behaviors and two team learning beliefs, team confidence (Edmondson, 1999; Gibson, 1999; Van den Bossche et

al., 2006) and interpersonal understanding (Druskat & Kayes, 2000), seen at the team level also holds at the individual level.

Instructors who are interested in increasing student collaboration can use the study results. The model demonstrates that an individual's confidence in the team and his or her interpersonal understanding increase team learning behavior. Anything the instructor can do to build that confidence and help students with interpersonal understanding will increase the degree to which the team members work together.

As further research is conducted as recommended related to team context and characteristics, updates to this model will provide further insights to instructors about the team learning process in student classroom teams. Updates may be in the form of additional learning beliefs, distinctive learning behaviors or better understanding of performance attributes. Additional understanding about how team learning beliefs and behaviors develop and under what conditions they are present will assist instructors. This knowledge will allow instructors insight into how to facilitate an environment more similar to industry in the classroom. Through task design, team design and coaching instructors can help facilitate the development of team learning skill.

Performance and Individual Team Learning Behaviors

Results of this study related to performance are interesting in that the relationship that has been found in other literature at the team level was not found at the individual level. This may be the case because the performance measure in this study was a peer assessment of four different performance areas. There may be some bias involved in peer assessment; however, peer evaluations among university students have been found to be "fairly accurate and reliable" (Orpen, 1994, p. 6).

The lack of significant results related to performance may have been influenced by the type of performance measure in this study, which evaluated the team member in specific performance areas rather than actual work produced. This was done because it is difficult to parse out the individual portions of the team projects. Post hoc analysis revealed a significant relationship between CAL and the performance measure “ability to help the group excel” and mixed results with the performance measure “participation and communication.” This suggests that learning behavior predicts different team member performance areas differently.

An alternative explanation for the insignificant results related to performance is the type of tasks required by the team. The tasks required by the students did not take into account the full range of possible types of tasks. Some tasks could have been completed by each team member and then combined — an additive type of task. Some tasks required greater integration that may have been dependent on the weakest or strongest member — conjunctive or disjunctive type task respectively.

It is recommended that future research take into account different measures of performance. At the individual level, performance can be measured through peer evaluation of performance areas, as in this study, and by actual contribution to the project, by asking students to directly rate the individual’s contribution or by observing all team meetings in a laboratory setting. If possible, instructor ratings of individuals may also be used to measure individual performance. In industry contexts, individual performance can be measured through third-party raters (i.e., customers).

Other Considerations

Another interesting finding of the study is the insignificant correlations between peer and self ratings of interpersonal understanding. The mean score of individual self-perception of interpersonal understanding (mean = 5.29) was lower than the peer assessment score (mean = 5.65). It is unclear why this difference exists. A higher self score may have been attributed to individuals' awareness of others that went unexpressed to peers. This difference opens up an opportunity for researchers and practitioners alike. Researchers can explore perception difference theoretically. Practitioners can use it for team feedback, similar to a 360-degree feedback process. In addition to the individual self-perception information, peer assessment scores can further help the individual explore his or her team learning beliefs and behaviors.

In addition to team contexts and characteristics, future research should consider individual characteristics. The impact of learning styles, personality, and gender may be appropriate to consider. Individual context may include the other demands the individual team member may have outside of the team. In student teams, students may be a member of more than one class team, and work responsibilities and other demands may play a role in their commitment to the team and thereby the degree of team learning exhibited.

This study focused on the individual in a group process. Future research should consider both the individual and group levels during analysis. The individual measure about the team processes requires that team processes be understood as well. As both levels are studied simultaneously, greater insight will be gained into how individuals enact the group process. Recommendations regarding team context and characteristic differences as described previously are also applicable at the group level. The

recommendations related to performance are valid as well. Performance can be measured at the group level through project grades and when possible in other contexts through actual project results in terms of time to complete, quality, or quantity.

Limitations

Limitations in this study will be discussed in three areas, those related to the sample, design and analysis. The sample of 201 students met the sample size required for exploratory factor analysis suggested by Guadagnoli and Velicer (1988). Other researchers have suggested larger sample sizes. The sample used in this study was from one university and business school. This sample may not take into account difference between institutions. In the same way the inclusion of students from only two classes limits the range of team types and task types that were included. Differences in task structure may constrain team creativity.

The model was initially developed in the business education context (Kayes & Kayes, 2007; Kayes & Burnett, 2005, 2006), and this study was conducted in the classroom. The extent to which the model and the measure will hold in similar teams outside of the classroom setting remains to be seen. Both are expected to be applicable to adult learners. Further research to test the model and measure with different team contexts and characteristics is needed.

The design of the study also presents a number of limitations. The cross-sectional survey design of the study does not allow any conclusions to be made about causality. This single point of data collection does not consider changes that may occur over time. That is to say that learning beliefs and behaviors may be different at different points in

time as a result of changes to individual members, the team as a whole or the environment in which the team operates.

Self-report measures are inherently problematic (Podsakoff & Organ, 1986). The measure developed for this study is no different. The constructs in the study were each is measured through one self-report measure, creating the opportunity for common method variance problems. A measure can also suffer from consistency motif and social desirability. Peer evaluations compared with the self-assessment revealed perception differences between the self and peer assessment of interpersonal understanding. As with any developmental tool of this kind, it is important for participants to be made aware of the limitations and the fact that they will be best served by responding as honestly as possible. In addition, gathering assessments from team members and/or third parties would also be helpful as a development tool to supplement the individual measure from this study.

Limitations are also present related to the analysis. One of the assumptions of regression analysis is that the data are distributed normally. The data in this study were moderately skewed in the positive direction. Steps were taken to transform the data into a normal distribution in order to meet the assumption. Three methods, the square root transformation, logarithmic transformation, and inverse transformation, were used. None of these transformations were sufficient to establish the data as a normal distribution. In addition the high intercorrelations between the variables may have influenced the results.

Conclusion

This study is the first step in the development of a measure and model of individual self-perception of team learning for use in the business education classroom.

It provides new insight about the role of the individual in the team learning process model benefiting researchers and instructors alike. Future research, as suggested, will further this understanding allowing for business schools to better prepare students for today's business world.

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APPENDIX A:

SELF-PERCEPTION OF TEAM LEARNING BELIEFS AND BEHAVIORS

QUESTIONNAIRE

Team Learning Beliefs and Behaviors

The numbered items below are sentence endings which begin with “As a team member I.” Consider the semester-long team that you are a member of in this class. As objectively as possible, evaluate each of the items. Your first impression is sufficient; there is no need to overthink the question. There is no right or wrong answer, and your evaluation will have no impact on your team’s class performance. Circle the number that represents the degree to which the sentence very accurately to very inaccurately represents you in your team.

1	2	3	4	5	6	7
<i>Very Inaccurate</i>	<i>Mostly Inaccurate</i>	<i>Slightly Inaccurate</i>	<i>Neutral</i>	<i>Slightly Accurate</i>	<i>Mostly Accurate</i>	<i>Very Accurate</i>

As a team member I...

1	believe that team members have the freedom to share different opinions.	1	2	3	4	5	6	7
2	don’t pay attention to the mood swings of other team members.	1	2	3	4	5	6	7
3	know the specific areas of expertise of team members.	1	2	3	4	5	6	7
4	believe that team members typically share a common goal.	1	2	3	4	5	6	7
5	think it is unacceptable for one team member to challenge another team member’s viewpoint.	1	2	3	4	5	6	7
6	know when a team member is having a bad day.	1	2	3	4	5	6	7
7	understand the unique work performed by team members.	1	2	3	4	5	6	7
8	generally focus on the team goal more than any one individual team member’s goal.	1	2	3	4	5	6	7
9	believe it is acceptable for team members to say something that may be controversial.	1	2	3	4	5	6	7
10	know when other team members are under stress.	1	2	3	4	5	6	7
11	am unaware of the strengths and weaknesses of other team members.	1	2	3	4	5	6	7
12	share the same goals as other team members.	1	2	3	4	5	6	7
13	encourage team members to express different viewpoints.	1	2	3	4	5	6	7
14	am aware of the feelings and moods of team members during meetings.	1	2	3	4	5	6	7
15	know which team member is best assigned to each task.	1	2	3	4	5	6	7

1	2	3	4	5	6	7
<i>Very</i>	<i>Mostly</i>	<i>Slightly</i>	<i>Neutral</i>	<i>Slightly</i>	<i>Mostly</i>	<i>Very</i>
<i>Inaccurate</i>	<i>Inaccurate</i>	<i>Inaccurate</i>		<i>Accurate</i>	<i>Accurate</i>	<i>Accurate</i>

As a team member I...

16	focus on meeting individual member goals rather than the group goals.	1	2	3	4	5	6	7
17	give other team members feedback without offending them.	1	2	3	4	5	6	7
18	am aware of the interpersonal dynamics between other team members.	1	2	3	4	5	6	7
19	believe that each team member should have clearly divided tasks.	1	2	3	4	5	6	7
20	recognize how individual team members' goals fit in with team goals.	1	2	3	4	5	6	7
21	am supportive when other team members admit mistakes.	1	2	3	4	5	6	7
22	recognize when a team member is in a bad mood.	1	2	3	4	5	6	7
23	understand the division of labor among team members.	1	2	3	4	5	6	7
24	understand the individual goals of team members.	1	2	3	4	5	6	7
25	am often uncertain about whether or not my team will be successful.	1	2	3	4	5	6	7
26	keep other team members informed about my work.	1	2	3	4	5	6	7
27	take corrective action when my team faces an unexpected problem.	1	2	3	4	5	6	7
28	share my knowledge of the team's processes and procedures with other team members.	1	2	3	4	5	6	7
29	know that my team can accomplish anything.	1	2	3	4	5	6	7
30	am only aware of my work on the team.	1	2	3	4	5	6	7
31	help the team with unexpected team issues.	1	2	3	4	5	6	7
32	regularly review how the team accomplishes work.	1	2	3	4	5	6	7
33	am confident that my team will perform well.	1	2	3	4	5	6	7
34	get work done with other team members without being told how.	1	2	3	4	5	6	7
35	get stuck when the team faces a roadblock.	1	2	3	4	5	6	7
36	correct possible mistakes before they happen.	1	2	3	4	5	6	7
37	believe that my team will be successful.	1	2	3	4	5	6	7
38	coordinate my work with other team members.	1	2	3	4	5	6	7
39	know what to do if something unusual goes wrong.	1	2	3	4	5	6	7
40	suggest improvement to team processes and procedures.	1	2	3	4	5	6	7
41	believe that my team can solve any issues it faces.	1	2	3	4	5	6	7

1	2	3	4	5	6	7
<i>Very</i>	<i>Mostly</i>	<i>Slightly</i>	<i>Neutral</i>	<i>Slightly</i>	<i>Mostly</i>	<i>Very</i>
<i>Inaccurate</i>	<i>Inaccurate</i>	<i>Inaccurate</i>		<i>Accurate</i>	<i>Accurate</i>	<i>Accurate</i>

As a team member I...

42	stay up-to-date on the status of other team members' work.	1	2	3	4	5	6	7
43	step in when other team members encounter an unexpected problem.	1	2	3	4	5	6	7
44	often repeat the same mistakes.	1	2	3	4	5	6	7
45	believe that my team will perform better than other teams.	1	2	3	4	5	6	7
46	accomplish work with other team members without thinking too hard.	1	2	3	4	5	6	7
47	discuss how the team should respond to team setbacks when they occur.	1	2	3	4	5	6	7
48	suggest ways for the team to improve	1	2	3	4	5	6	7

APPENDIX B:

CARD SORT ANALYSIS MATRIX

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
Roles: The degree to which team members have a distinct division of labor, understand the strengths and weaknesses of other members, and know the unique skills or tasks assigned to other members.					
11	4	am unaware of the strengths and weaknesses of team members. (reverse-scored item)	78.57% Roles 21.43% Interpersonal Understanding —weaknesses of ‘other’ team	Moderate agreement. Confusion with interpersonal understanding may be due to reverse-scoring or the idea of preferences in the definition of interpersonal understanding. Although agreement is moderate, the item is fundamental to this construct. Minor Change.	am unaware of the strengths and weaknesses of other team members. (reverse-scored item)
19	6	believe that each team member should have clearly divided tasks.	78.57% Roles 14.29% Coordinating 7.14% Goals	Moderate agreement. Fundamental to construct. No Change.	believe that each team member should have clearly divided tasks.
3	29	know the specific areas of expertise of team members.	92.86% Roles 7.14% Trust	Excellent agreement. Fundamental to the construct. No Change.	know the specific areas of expertise of team members.
15	33	know which team member is best assigned to each task.	85.71% Roles 14.29% Coordinating	Excellent agreement. Fundamental to the construct. No Change.	know which team member is best assigned to each task.
23	44	understand the division of labor among team members.	92.86% Roles 7.14% Coordinating	Great agreement. Fundamental to the construct. No Change.	understand the division of labor among team members.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
			—...labor among the team members.		
7	46	understand the unique work performed by team members.	78.57% Roles 14.29% Coordinating 7.14% Confidence —...performed by each team member.	Moderate agreement. Fundamental to the construct. No Change.	understand the unique work performed by team members.
Goals: The degree to which the team members share perceptions that they have a clear and shared goal or common purpose.					
4	12	believe that team members typically share a common purpose.	92.86% Goals 7.14% Confidence	Excellent agreement. Changed 'purpose' to goals to remain consistent. Minor Change.	believe that team members typically share a common goal.
16	19	focus on meeting individual member goals rather than the group goals. (reverse-scored item)	100% Goals —...meeting personal goals rather...	Excellent agreement. No Change.	focus on meeting individual member goals rather than the group goals. (reverse-scored item)
8	20	generally focus on the team success more than any one individual team member's success.	57.14% Goals 21.43% Confidence 14.29% Continuous Improvement 7.14% Trust —...I focus on the team's success more than the success of individual team members.	Weak agreement. It appears that the idea of success causes confusion by focusing on the outcome. This item has been rewritten to be consistent with the definition regarding goals. Major Change.	generally focus on the team goal more than any one individual team member's goal.
20	36	recognize how individual team members' goals fit in with team goals.	92.86% Goals 7.14% Interpersonal Understanding	Excellent agreement. No Change.	recognize how individual team members' goals fit in with team goals.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
			—Delete 'in.'		
12	38	share the same goals as other team members.	92.86% Goals 7.14% Confidence	Excellent agreement. No Change.	share the same goals as other team members.
24	45	understand the individual goals of team members.	100% Goals	Excellent agreement. No Change.	understand the individual goals of team members.
Team Confidence: The group confidence level, in terms of how strongly the group members share the perception that they can accomplish the task put forth before them.					
33	1	am confident that my team will perform well.	100% Confidence	Excellent agreement. No Change.	am confident that my team will perform well.
25	2	am often uncertain about whether or not my team will be successful. (reverse-scored item)	92.86% Confidence 7.14% Goals —Often – largely or just delete	Excellent agreement. No Change.	am often uncertain about whether or not my team will be successful. (reverse-scored item)
41	8	believe that my team can typically solve any issues it come up against.	71.43% Confidence 21.43% Adapting 7.14% Trust —...it comes up against (2x) —...issues which/that it comes against?	Weak agreement. Confusion with adapting likely due to the idea that it is an issue that 'comes up.' Change.	believe that my team can solve any issues it faces.
37	9	believe that my team will be successful.	92.86% Confidence 7.14% Trust	Excellent agreement. No Change.	believe that my team will be successful.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
45	10	believe that my team will perform better than other teams.	85.71% Confidence 14.29% Continuous Improvement —Other teams: any team or comparable teams/relevant teams?	Good agreement. No Change.	believe that my team will perform better than other teams.
29	28	know that my team can accomplish anything.	92.86% Confidence 7.14% Goals —‘believe’ instead of ‘know’ —...of each team member	Excellent agreement. No Change.	know that my team can accomplish anything.
Interpersonal Understanding: The degree to which team members can recognize and comprehend the emotional states, preferences, or relationships of individuals in the group.					
14	5	Aware of the feelings and moods of team members at each meeting.	92.86% Interpersonal Understanding 7.14% Coordinating —Member I ‘am’ aware (3x) —...team members during meetings.	Excellent agreement. Minor Change.	am aware of the feelings and moods of team members during meetings.
2	16	don’t pay attention to individual team member mood swings. (reverse-scored item)	100% Interpersonal Understanding —...attention to the mood swings of other team members.	Excellent agreement. Minor Change.	don’t pay attention to the mood swings of other team members. (reverse-scored item)
18	27	know how team members get along.	71.43% Interpersonal Understanding 14.29% Coordinating 7.14% Adapting 7.14% Trust	Weak agreement. Changes attempt to emphasize interpersonal relationship. Change.	am aware of the interpersonal dynamics between other team members.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
6	31	know when a team member is having a bad day.	100% Interpersonal Understanding —Seems like a repeat of #47	Excellent agreement. No Change.	know when a team member is having a bad day.
10	32	know when individual team members are under stress.	100% Interpersonal Understanding —Unable to classify —...I can tell when other team	Excellent agreement. Minor Change.	know when other team members are under stress.
22	47	understand when a team member is in a bad mood.	92.86% Interpersonal Understanding 7.14% Trust —...I recognize when a... —Seems like a repeat of #31	Excellent agreement. No Change.	recognize when a team member is in a bad mood.
<p>Trust: The shared perception by team members about the nature of the group and its members (including the leader) regarding the psychological climate, emotional disposition of the group, and the degree to which members of the group are willing to share sensitive information, especially as it relates to people's ability to feel safe to make or admit errors and mistakes, or take challenging or controversial positions without fear of serious repercussions.</p>					
21	3	am supportive when other team members admit mistakes.	57.14% Trust 35.71% Interpersonal Understanding 7.14% Continuous Improvement —This seems to intend to mean continuous improvement but sounds like asking about trust.	Weak agreement. Confusion with interpersonal understanding likely due to inclusion of emotion in definition. Item is fundamental to the construct. No Change.	am supportive when other team members admit mistakes.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
9	7	believe that it is acceptable for team members to say something that may be seen as unpopular.	76.92% Trust 7.69% Interpersonal Understanding 7.69% Roles —I believe it is acceptable ...may be unpopular. —Unable to classify	Moderate agreement. Edited to make clearer. Change.	believe it is acceptable for team members to say something that may be controversial.
1	11	believe that team members should share different opinions.	57.14% Trust 21.43% Interpersonal Understanding 7.14% Coordinating 7.14% Continuous Improvement 7.14% Adapting —...that all team members should share their opinions (even if they are different)	Weak agreement. The reason for sharing different opinions is ambiguous, leading to confusion with four other constructs. Need to refocus on the idea that it is acceptable, not a requirement. Change.	believe that team members have the freedom to share different opinions.
13	17	encourage team members to express many different viewpoints.	57.14% Trust 28.57% Continuous Improvement 7.14% Interpersonal Understanding 7.14% Roles —Delete 'many'	Weak agreement. Confusion with interpersonal understanding addressed in rewrite of definition. Minor Change.	encourage team members to express different viewpoints.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
17	22	give others team members feedback without them being offended.	64.29% Trust 21.43% Interpersonal Understanding 7.14% Continuous Improvement 7.14% Adapting —Others team members? —...without offending them.	Weak agreement. Confusion with interpersonal understanding likely due to inclusion of emotion in definition. Item is fundamental to the construct. Minor Change.	give other team members feedback without offending them.
5	43	think it is unacceptable for other team members to challenge other team member's view point. (reverse-scored item)	100% Trust —...for one team member to challenge another... —...challenge others' viewpoint: this wording is a bit confusing but not sure how to reword	Excellent agreement. Minor Change.	think it is unacceptable for one team member to challenge another team member's view point. (reverse-scored item)
Coordinating: The seamless, often tacit or unconscious, organizing of diverse roles; coordination of knowledge and responsibility in teams.					
38	23	help coordinate team member as they work with one another.	92.86% Coordinating 7.14% Roles —Member needs to be plural (2x) —What does 'coordinate' mean here? Physically organizing/emotionally guiding?	Excellent agreement. This item is quite leader focused, inconsistent with member measure. Change.	coordinate my work with other team members.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
26	25	keep others team members informed about my independent work.	71.43% Coordinating 21.43% Roles 7.14% Interpersonal Understanding —Others team members? —Other team members (2x)	Weak agreement. The idea of independent work seems to be confused with individual roles. Minor Change.	keep other team members informed about my work.
42	26	keep up to date on the progress of team projects.	64.29% Coordinating 28.57% Continuous Improvement 7.14% Roles —Add hyphens to up-to-date	Weak agreement. The focus needs to be on getting work done not on improvement. The focus on progress may have implied improvement. Minor Change.	stay up-to-date on the status of other team members' work.
30	34	never ask what other members are going to do. (reverse-scored item)	50% Coordinating 28.57% Roles 7.14% Trust 7.14% Confidence —'never ask'?	Weak agreement. Focus on getting work done together instead of what members are going to do, which implies identifying roles. Change.	am only aware of my work on the team. (reverse-scored item)
46	48	work with other team members without thinking too hard about it.	64.29% Coordinating 14.29% Interpersonal Understanding 7.14% Trust 7.14% Confidence 7.14% Roles —Wording is funny. Not sure exactly where it fits.	Weak agreement. This item focuses on the tacit element of the construct and cannot be entirely eliminated. Change.	accomplish work with other team members without thinking too hard.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
New 34				One item was moved to adapting. A new item was added such that two items address the tacit element of this construct. New.	get work done with other team members without being told how.
Adapting: The team's ability to respond to unexpected internal and external demands resulting from problems and roadblocks by adjusting actions and beliefs.					
31	13	can respond to new issues as they arise.	78.57% Adapting 21.43% Continuous Improvement	Moderate agreement. Attempt is made to distinguish from continuous improvement by adding 'unexpected,' and focus is given to this being an internal issue. Change.	help the team with unexpected team issues.
47	15	discuss with other team member how to deal with team setbacks.	35.71% Adapting 42.86% Continuous Improvement 14.29% Coordinating 7.14% Trust —Member needs to be plural (3x) —Perhaps delete 'team' setbacks since individual setbacks can also slow down a team.	No agreement. Changes made in an attempt to distinguish from continuous improvement by emphasizing that the discussion is an immediate response to an issue rather than a reflective analysis of the process. Change.	discuss how the team should respond to team setbacks when they occur.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
35	21	get stuck when the team faces a roadblock. (reverse-scored item)	92.86% Adapting 7.14% Continuous Improvement —Or should this be: I believe the team often gets stuck when it faces a roadblock.	Excellent agreement. No change.	get stuck when the team faces a roadblock. (reverse-scored item)
43	24	help my team when it faces a tense situation.	28.57% Adapting 21.43% Coordinating 21.43% Trust 14.29% Interpersonal Understanding 14.29% Continuous Improvement	No agreement. The idea of tense situations seems to be confused with getting work done and with interpersonal issues. Remove.	
39	30	know what to do if something goes wrong.	85.71% Adapting 14.29% Continuous Improvement	Good agreement. Add emphasis to the issues that have gone wrong being unusual. Minor Change.	know what to do if something unusual goes wrong.
34 Change to item #43	39	step in when other team members have a problem.	7.14% Coordinating 35.71% Adapting 28.57% Continuous Improvement 21.43% Roles 7.14% Trust —This card could be adapting or roles to me.	No agreement with Coordination, which is what this items was originally intended for. Item moved and changed to address the response to a sudden change. Change.	step in when other team members encounter an unexpected problem.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
27	42	take corrective action when my team faces an unexpected problem.	71.43% Adapting 21.43% Continuous Improvement 7.14% Roles	Weak agreement. Fundamental to the construct. No Change.	take corrective action when my team faces an unexpected problem.
Continuous Improvement: Working together to incrementally improve the team's ability to learn and respond to ongoing and routine challenges by sharing information and avoiding mistakes.					
36	14	correct possible mistakes before they happen.	85.71% Continuous Improvement 14.29% Adapting	Good agreement. No Change.	correct possible mistakes before they happen.
40	18	evaluate team processes and procedures.	57.14% Continuous Improvement 35.71% Coordinating 7.14% Adapting	Weak agreement. Emphasis added with 'suggest improvement' to minimize confusion with coordinating. Change.	suggest improvement to team processes and procedures.
44	35	often repeat the same mistakes several times. (reverse-scored item)	57.14% Continuous Improvement 28.57% Adapting 7.14% Trust 7.14% Goals —Delete 'several times'	Weak agreement. Fundamental to the construct. Minor Changes.	often repeat the same mistakes. (reverse-scored item)
28	37	share my knowledge with team members who are less experienced.	42.86% Continuous Improvement 42.86% Coordinating 14.29% Adapting —...members with less experience.	No agreement. Focus given to sharing knowledge about processes and procedures rather than knowledge in general. Removed the idea of less experienced since most student team members will have the same amount of training. Change.	share my knowledge of the team's processes and procedures with other team members.

Item #	Card #	Original As a team member I...	Card sort results	Analysis	Analysis/final item
32	40	suggest several alternative ways to solve a problem.	50% Continuous Improvement 42.86% Adapting 7.14% Coordinating —Sounds more like problem solving	No agreement. Changed to focus to review rather than solving problems that could arise unexpectedly. Change.	regularly review how the team accomplishes work.
48	41	suggests ways for the team to improve.	92.86% Continuous Improvement 7.14% Adapting —...I often suggest ways...	Excellent agreement. Minor Change.	suggest ways for the team to improve.

APPENDIX C:
CONVERGENT MEASURES

Team Assessment

Consider the semester-long team that you are a member of in this class. As objectively as possible, evaluate each of the following statements about your team. Your first impression is sufficient; there is no need to overthink the question. There is no right or wrong answer, and your evaluation will have no impact on your team's class performance. Circle the number representing the degree to which you agree with the statement, from Completely Disagree to Completely Agree.

1	2	3	4	5	6	7
<i>Completely Disagree</i>	<i>Mostly Disagree</i>	<i>Slightly Disagree</i>	<i>Neutral</i>	<i>Slightly Agree</i>	<i>Mostly Agree</i>	<i>Completely Agree</i>

Roles

- | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | My team members depend on me for information and advice. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | I depend on my team members for information and advice. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | The team members agree on what we want to accomplish. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | When my team members succeed in their jobs, it works out positively for me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Goals

- | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | This team is united in trying to reach its goals for performance. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | I'm unhappy with my team's level of commitment to the task. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | The team members have conflicting aspirations for the team's performance. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | This team does not give me enough opportunities to improve my personal performance. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Team Confidence

- | | | | | | | | | |
|---|--|---|---|---|---|---|---|---|
| 1 | This team has confidence in itself. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | This team believes that no assignment is too tough for us. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | This team expects to be known as a highly performing group. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | This team believes it can become exceptionally good and successfully accomplish each assignment. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | This team believes it can be effective. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6 | This team can get a lot done when it works hard. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Interpersonal Understanding

1	Unless someone came out and said it, group members wouldn't know if one of our group members was upset.	1	2	3	4	5	6	7
2	People in our group keep their concerns hidden.	1	2	3	4	5	6	7
3	In any situation, our group could tell you what each member would be worried about.	1	2	3	4	5	6	7
4	When one of us is in a bad mood, people in the group notice.	1	2	3	4	5	6	7

Coordinating

1	Team members elaborate on each other's information and ideas.	1	2	3	4	5	6	7
2	Information from team members is complemented with information from other team members.	1	2	3	4	5	6	7
3	Team members draw conclusions from the ideas that are discussed in the team.	1	2	3	4	5	6	7

Continue to evaluate your semester-long team as above by rating the accuracy of the following statements using the scale Very Inaccurate to Very Accurate.

1	2	3	4	5	6	7
<i>Very Inaccurate</i>	<i>Mostly Inaccurate</i>	<i>Slightly Inaccurate</i>	<i>Neutral</i>	<i>Slightly Accurate</i>	<i>Mostly Accurate</i>	<i>Very Accurate</i>

Adapting

1	This team tends to handle differences of opinion privately or off-line, rather than addressing them directly as a group.	1	2	3	4	5	6	7
2	Team members go out and get all the information they possibly can from others—such as a customer or other parts of the organization.	1	2	3	4	5	6	7
3	We invite people from outside the team to present information or have discussion with us.	1	2	3	4	5	6	7

Continuous Improvement

1	We regularly take time to figure out ways to improve our team's work processes.	1	2	3	4	5	6	7
2	This team frequently seeks new information that leads us to make important changes.	1	2	3	4	5	6	7
3	In this team, someone always makes sure that we stop to reflect on the team's work processes.	1	2	3	4	5	6	7
4	People in this team often speak up to test assumptions about issues under discussion.	1	2	3	4	5	6	7

Trust

1	If you make a mistake on this team, it is often held against you.	1	2	3	4	5	6	7
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- | | | | | | | | | |
|---|--|---|---|---|---|---|---|---|
| 2 | Members on this team are able to bring up problems and tough issues. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | People on this team sometimes reject others for being different. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | It is safe to take a risk on this team. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | It is difficult to ask other members of this team for help. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6 | No one on this team would deliberately act in a way that undermines my efforts. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7 | Working with members of this team, my unique skills and talents are valued and utilized. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

APPENDIX D:

PEER ASSESSMENT

Write the name of each team member across the top of the space provided. Evaluate each of your team members by circling the number that best reflects each of the statements.

Team Member Name	/	/	/	/	/	/
Is aware of the unique skills and abilities of other team members and agrees that tasks should be divided based on team members' strengths and weaknesses	1	1	1	1	1	1 Very inaccurate
	2	2	2	2	2	2 Mostly inaccurate
	3	3	3	3	3	3 Slightly inaccurate
	4	4	4	4	4	4 Neutral
	5	5	5	5	5	5 Slightly accurate
	6	6	6	6	6	6 Mostly accurate
	7	7	7	7	7	7 Very accurate
Is aware of how individual team members' individual goals fit within the team goal and focuses on accomplishing the team goals	1	1	1	1	1	1 Very inaccurate
	2	2	2	2	2	2 Mostly inaccurate
	3	3	3	3	3	3 Slightly inaccurate
	4	4	4	4	4	4 Neutral
	5	5	5	5	5	5 Slightly accurate
	6	6	6	6	6	6 Mostly accurate
	7	7	7	7	7	7 Very accurate
Is confident that the team will succeed	1	1	1	1	1	1 Very inaccurate
	2	2	2	2	2	2 Mostly inaccurate
	3	3	3	3	3	3 Slightly inaccurate
	4	4	4	4	4	4 Neutral
	5	5	5	5	5	5 Slightly accurate
	6	6	6	6	6	6 Mostly accurate
	7	7	7	7	7	7 Very accurate
Believes it is acceptable to share their opinion, discuss other team members' opinions even when those opinions are unpopular, or acknowledge a mistake	1	1	1	1	1	1 Very inaccurate
	2	2	2	2	2	2 Mostly inaccurate
	3	3	3	3	3	3 Slightly inaccurate
	4	4	4	4	4	4 Neutral
	5	5	5	5	5	5 Slightly accurate
	6	6	6	6	6	6 Mostly accurate
	7	7	7	7	7	7 Very accurate
Is aware of other team members' moods, feelings, and stress levels	1	1	1	1	1	1 Very inaccurate
	2	2	2	2	2	2 Mostly inaccurate
	3	3	3	3	3	3 Slightly inaccurate
	4	4	4	4	4	4 Neutral
	5	5	5	5	5	5 Slightly accurate
	6	6	6	6	6	6 Mostly accurate
	7	7	7	7	7	7 Very accurate

Team Member Name						
Accomplishes work with the team by staying up-to-date with other team members' activities and keeping the team apprised of his or her own activity	1	1	1	1	1	1 Very inaccurate
	2	2	2	2	2	2 Mostly inaccurate
	3	3	3	3	3	3 Slightly inaccurate
	4	4	4	4	4	4 Neutral
	5	5	5	5	5	5 Slightly accurate
	6	6	6	6	6	6 Mostly accurate
	7	7	7	7	7	7 Very accurate
Responds to, and helps the team respond to, unexpected and unusual events so that the team's work still gets done	1	1	1	1	1	1 Very inaccurate
	2	2	2	2	2	2 Mostly inaccurate
	3	3	3	3	3	3 Slightly inaccurate
	4	4	4	4	4	4 Neutral
	5	5	5	5	5	5 Slightly accurate
	6	6	6	6	6	6 Mostly accurate
	7	7	7	7	7	7 Very accurate
Helps the team improve how work is accomplished by evaluating and suggesting improvements to team processes and procedures	1	1	1	1	1	1 Very inaccurate
	2	2	2	2	2	2 Mostly inaccurate
	3	3	3	3	3	3 Slightly inaccurate
	4	4	4	4	4	4 Neutral
	5	5	5	5	5	5 Slightly accurate
	6	6	6	6	6	6 Mostly accurate
	7	7	7	7	7	7 Very accurate

APPENDIX E:

PEER APPRAISAL

Evaluate each member of your semester-long team by circling the number that best reflects the extent to which he or she participated, was prepared, helped the group excel, and was a team player. Use the following ratings:

- 4** Usually (over 90% of the time) **2** Sometimes (less than half the time)
3 Frequently (more often than not) **1** Rarely (never or once in a great while)

Preparation Is prepared for team meeting; has read course material and understands the issues and subject matter; completes team assignments on time; attends and is on time to team meetings.				
Participation and Communication Articulates ideas effectively when speaking or writing; submits papers without grammatical errors; listens to others; encourages others to talk; is persuasive when appropriate.				↓
Helps Group Excel Expresses great interest in group success by evaluating ideas and suggestions; initiates problem solving; influences and encourages others to set high standards; doesn't accept just any idea but looks for the best idea; stays motivated from beginning to end of the project.			↓	↓
Team Player Knows when to be a leader and a follower; keeps an open mind; compromises when appropriate; can take criticism; respects others.		↓	↓	↓
	↓	↓	↓	↓
Member Name	Team Player	Helps Group Excel	Communication	Preparation
	4 usually 3 frequently 2 sometimes 1 rarely			
	4 usually 3 frequently 2 sometimes 1 rarely			
	4 usually 3 frequently 2 sometimes 1 rarely			
	4 usually 3 frequently 2 sometimes 1 rarely			
	4 usually 3 frequently 2 sometimes 1 rarely			

Adapted from Baker, 2008.

APPENDIX F:
CONSTRUCT DEFINITIONS AND DESCRIPTIONS

	Definition	Description
Shared task beliefs		
Goals	Team members' knowledge of the team goals and individual goals within the context of the team.	The degree to which the team members share perceptions that they have a clear and shared goal and understand individual goals in the context of the group goals.
Roles	Team members' knowledge of each other's ability.	The degree to which team members know the strengths and weaknesses of other members; know the unique skills or tasks expected of other members; and believe that tasks should be divided between members.
Team confidence	Team members' belief that the team will succeed.	The degree to which team members share the perception that they can accomplish the team's required task.
Shared interpersonal beliefs		
Trust	Team members' belief that it is acceptable to share sensitive information.	The degree to which team members share the perception that it is acceptable to share sensitive or contrarian information. Includes admitting errors/mistakes, providing feedback, and taking challenging/controversial positions without fear of repercussions.
Interpersonal understanding	Team members' knowledge of interpersonal group dynamics.	The degree to which team members can recognize and comprehend the emotional states, preferences, or relationships of individuals in the group.
Learning behaviors		
Coordination	Team members' ability to get work done.	Team members' ability to work seamlessly together—consciously and unconsciously—to get work done—including organizing diverse roles, sharing knowledge, managing work processes, and assisting others.
Continuous improvement	Team members' ability to improve how they get work done.	Team members' ability to avoid mistakes and improve the team's performance by reviewing processes and procedures.
Adapting	Team members' ability to respond to unexpected and unusual events and still get work done.	Team members' ability to respond to unexpected and unusual demands, problems, and roadblocks—internal and external—that would prevent the team from accomplishing work.