Cooperative Learning: Attitudes, Perceptions, and Achievement in a Traditional, Online, and Hybrid Instructional Setting

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COOPERATIVE LEARNING: ATTITUDES, PERCEPTIONS, AND
ACHIEVEMENT IN A TRADITIONAL, ONLINE, AND
HYBRID INSTRUCTIONAL SETTING

by

Allison Hardin Duckworth

Abstract of a Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

May 2010
ABSTRACT

COOPERATIVE LEARNING: ATTITUDES, PERCEPTIONS, AND ACHIEVEMENT IN A TRADITIONAL, ONLINE, AND HYBID INSTRUCTIONAL SETTING

by Allison Hardin Duckworth

May 2010

Cooperative learning has been sufficiently studied to be accepted as an effective method of education. Student reception of cooperative learning, and therefore the degree of its success in a given situation, will depend on the mode of delivery. New technology for delivering courses totally online challenges many aspects of traditional education, and is particularly difficult for cooperative learning that relies heavily on intense face-to-face communication among students. This study was conducted to compare cooperative learning in a traditional setting to that in hybrid and online settings. A model for delivering a cooperative learning experience has been developed utilizing concept maps within an upper division college course, History of Biology, as well as a hybrid version of the same course with the cooperative learning module run in a traditional class while the rest of the course remained online. A variation of this model is also being used to compare traditional and hybrid formats of introductory biology courses. The model for cooperative learning worked well for the majority of students. Based on attitudinal results, cooperative learning is equally successful regardless of the amount of face-to-face interaction. Students in the online version of this course were pleased with their cooperative learning
experience despite the absence of this interaction. Many stated that it helped them gain a deeper understanding of the material. It also provided students with an environment conducive to peer tutoring and social interaction which is often missing from many online experiences. In each course, an increase in achievement was also indicated. This increase was significant for the hybrid and traditional setting. This model, however, was very challenging for the instructor. The hybrid version of the course was much more user-friendly than its fully online counterpart. This alternative method allows a relatively easy incorporation of cooperative learning for both students and instructor.
DEDICATION

This dissertation is dedicated to my family. Their encouragement, support, and unconditional love have allowed me to complete this major milestone in my professional career. To my husband Todd, your patience and understanding throughout this long process has permitted me to follow my dream and finish what seemed like a never-ending task. To my three boys, Jacob, Wyatt, and Will, may you always strive for the top! I hope that through my example you will see the value of education and share the love for learning that I do. To my parents and grandparents, thank you for instilling in me the desire to always do my best and the work ethic required to accomplish my goals. Each of you has stood by me throughout this journey and can now rejoice with me now that it has ended. I love you all!
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Thanks also go to my statistician, Dr. Kyna Shelley for taking time to answer my questions and assist with my data analysis. I would also like to thank my other committee members, Dr. Sherry Herron, Dr. Deborah Booth, and Dr. Jacob Blickenstaff for there continued support and advice through the dissertation process.
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CHAPTER I
INTRODUCTION

Instruction in higher education for centuries has been associated with traditional face-to-face interaction where the instructor is the main source of information. Students are lectured to and expected to understand and regurgitate the same information on test day.

These problems are endemic to all institutions of education, regardless of level... Little or no attention is paid to the learning process; even though much research exists documenting that real understanding is a case of active restructuring on the part of the learner. Restructuring occurs through engagement in problem posing as well as problem solving, inference making and investigation, resolving of contradictions and reflecting. These processes all mandate far more active learners, as well as a different model of education than the one subscribed to as present by most institutions. Rather than being powerless and dependent on the institution, learners need to be empowered to think and learn for themselves. Thus, learning needs to be conceived of as something a learner does, not something that is done to a learner. (Catherine Fosnot, as cited in Johnson, Johnson, & Smith, 1991, p. 1:20-21)

This statement accentuates the need for active learning. Several research studies indicate that the most appropriate place for active, hands-on instruction is the science classroom (Bilgin, 2006). One such method of active learning that has gained much attention within the last few decades is cooperative learning.
Cooperative learning utilizes group interaction to improve understanding of content distributed within a particular course. It also has been associated with higher achievement, more positive attitudes and motivation, as well as socialization skills.

The mission of many institutions of higher learning is to prepare students for the work force. College classrooms, however, tend to promote an atmosphere of competition: competition for grades, competition for scholarship and internships, and competition for job placement. The implementation of cooperative learning in the college classroom reduces the competitive nature among students and promotes cooperation. Kohn (1986) states that cooperation is connected with success, whereas competitiveness can be detrimental to success. In order to provide a student population that will be successful in the work force, college instructors must find methods that promote active learning and cooperation among students. One method that meets both of those goals is cooperative learning.

As universities try to meet the needs of growing student populations, they are providing more nontraditional courses. Nontraditional courses include both online and hybrid designs. These are necessary to reach a population of students who cannot meet a traditional class because of time or distance constraints. In recent years, universities have found themselves with an increasing nontraditional student population. This includes adults who have returned to school after several years in the workforce either to begin a degree plan or to further their existing education. Online instruction is especially
appealing to this diverse population. The economical benefit for the university is also a major advantage. More classes with larger enrollments can be offered and are no longer bound by the walls of the classroom.

Whether the online teaching and learning environment is being driven individually or collaboratively by globalization or the ever prominent demand for lifelong learning… it is all but assured that this approach to teaching will only increase and may even become the learning paradigm of the future. (Hutchinson, 2007, p. 1)

It is therefore prudent to remember the importance of active learning and to incorporate these methods into the “new paradigm” of online instruction.

But will it work? Research indicates that there is no significant difference between the outcomes in an online class when compared to a traditional class, and quality of online instruction is equal to face-to-face instruction (Warren & Holloman, 2005). Will this standard apply to cooperative learning, as well? When cooperative learning is entered into the online equation, it suddenly becomes more complex. Most models of cooperation assume that students will be in actual physical proximity to one another. That is not the case in an online class. English and Yazdani (1999) acknowledge that incorporating cooperative learning online will be a difficult process and require continued attention. It is, however, important to develop a cooperative learning model that works in an online atmosphere. One of the biggest challenges is determining how to manage small groups online to achieve effective learning (Hutchinson, 2007).
One solution to this problem is hybrid instruction. Hybrid instruction offers the “best of both worlds.” Cooperative learning activities occur in a regular scheduled class meeting, so teachers do not have to manage the group interactions online. The remainder of the course components can be offered online giving the student and instructor flexibility with regard to scheduling. Hybrid instruction may be one of the most unrecognized trends in higher education today (Young, 2002). It may provide the link that allows successful use of cooperative learning in a technologically advanced society.

The need to evaluate cooperative learning in both situations, online and hybrid instruction is evident. It is important to determine the students’ attitudes and perceptions toward a teaching method. Cooperative learning “in the way of enduring attitudes, of likes and dislikes, may be and often is much more important than…the lesson that is learned” (Dewey, as cited in Henson, 2003). These attitudes can have a direct effect on the success of the method in the classroom. Information provided by students about these cooperative experiences can provide valuable information to instructors who seek to incorporate meaningful, group oriented learning experiences into their online or hybrid course.

Statement of the Problem

Cooperative learning is a teaching method with success in improving achievement, attitude, social skill, as well as many other important educational goals. Its success has been documented primarily in traditional face-to-face classroom settings. Diversity within college populations and the increase in
technology has led to an increase in the utilization of different instructional environments, such as online or hybrid instruction. The problem investigated in this study was whether cooperative learning is an appropriate and successful teaching method in classroom settings that are nontraditional.

Purpose of the Study

The purpose of this study was to determine students' attitudes and perceptions toward the use of cooperative learning and their academic achievement using cooperative learning in three different learning environments (1) traditional, (2) online, and (3) hybrid. The study included one independent variable: Type of Instructional Environment. This design contained two dependent variables. One dependent variable was the student attitudes and perceptions as measured by a survey. The second dependent variable was student achievement. It was measured using a pre-test and post-testing design. The general goal of this research was to determine if cooperative learning is an appropriate and effective method of instruction in each of these instructional environments and in what type of environment is it most conducive to learning.

Theoretical Framework

The success of cooperative learning in the classroom is based on the theories of constructivism, behaviorism, and social interdependence. Constructivism is rooted in the ideas of educators and psychologists such as John Dewey, Jean Piaget, and Lev Vygostky (Kivinen & Ristela, 2003). With constructivism, students are responsible for constructing their own understanding. This understanding is constructed from previous ideas or
experiences the student already possesses. John Dewey’s teachings express the importance of active learning. The student should be actively constructing knowledge not passively absorbing it. Piaget and Vygotsky acknowledge the social aspect of constructivism. Interaction among peers can lead to new construction of knowledge; knowledge that may have not been constructed without the interaction. Cooperative learning takes advantage of active learning and social interaction to help students generate information with each experience.

The theory of behaviorism was a dominant educational theory for decades in the United States. It is based on work of psychologists such as James Watson and B. F. Skinner. Behaviorism promotes the idea that a rewarded behavior will be repeated. Cooperative learning utilizes this ideology to create groups that function well together. Students are rewarded for accomplishing goals set for the group. Repeated goal accomplishment leads to more rewards. Students have an incentive to work well together to meet group goals. Students are learning together as they attain each group goal.

The theory of social interdependence is largely based on the studies of Morton Deutsch and Roger and David Johnson. They theorized that the level of interdependence students have determines how they respond socially with one another. Group goals can be structured in such a way that success for one group member promotes success for another group member. Group goals are a necessary component of cooperative learning. They can be structured in such a
way as to promote success for the entire group. Success for the group results in increased knowledge or achievement for fellow students.

Research Questions

The focus of this study was to determine students’ attitudes and perceptions toward the use of cooperative learning and their academic achievement using cooperative learning in three different learning environments (1) traditional, (2) online, and (3) hybrid. The following questions were investigated during the research:

- What are the attitudes and perceptions of cooperative learning administered in traditional, online, and hybrid instructional settings?
- Is there a difference in the attitudes and perceptions of cooperative learning among the three instructional settings?
- What is the level of achievement for students using cooperative learning in traditional, online, and hybrid instructional settings?
- Is there a difference in the level of achievement for students using cooperative learning among the three instructional settings?

Hypotheses

The above questions were researched through the statistical evaluation of the following research hypotheses:

- Research Hypothesis 1: There is no statistical difference in the overall attitudes and perceptions of cooperative learning in a traditional, online, and hybrid instructional setting.
• Research Hypothesis 2: There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional setting based on quality of product and process.

• Research Hypothesis 3: There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional settings based on peer support.

• Research Hypothesis 4: There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional settings based on student interdependence.

• Research Hypothesis 5: There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional settings based on frustration with group members.

• Research Hypothesis 6: There is a statistical difference in pre-test and post-test scores for the traditional setting.

• Research Hypothesis 7: There is a statistical difference in the pre-test and post-test scores for the online setting.

• Research Hypothesis 8: There is a statistical difference in pre-test and post-test scores for the hybrid setting.

• Research Hypothesis 9: There is no statistical difference in achievement level of students using cooperative learning in a traditional, online, and hybrid instructional settings.
Assumptions

This study will be conducted with the assumption that all students who provided answers and feedback from the survey acted honestly and described their true feelings toward cooperative learning as it was portrayed in that particular setting.

Limitations

The research to be conducted is under the following limitations:

- Students in the research were limited to those enrolled in courses taught by myself and by mentor at a large university and community college in South Mississippi.
- Instruction occurring online or in the hybrid format was limited by the applications available through the Learning Management System, Blackboard.
- Instruction in hybrid classes will be of new design. Due to the novelty of hybrid courses at the two institutions involved in the research, the collection of data occurred in classes that were being taught for the very first time. Both instructors, however, had experience in online and traditional instruction.

Definition of Terms

- **Cooperative Learning**: “The instructional use of small groups so that students work together to maximize their own and each other’s learning” (Johnson, Johnson, & Holubec, 1993, p. 7).
• **Traditional Instruction**: Instruction that takes place on a college campus where students and teachers are located in the same place at the same time and face-to-face interaction occurs.

• **Nontraditional Instruction**: Instruction that may or may not take place on a college campus with few or no sessions of in-class instruction. Face-to-face interaction is limited or nonexistent. This includes both online or hybrid instruction.

• **Nontraditional Students**: Students who are older than the average college student, have other responsibilities outside of the school setting (job, family/children, etc.), and/or are enrolled in nontraditional courses.

• **Online Instruction**: A type of distance education. Instruction that occurs completely outside of the regular classroom setting with the use of a Learning Management System (LMS) and the Internet to deliver course content and evaluation.

• **Hybrid Instruction**: Instruction that incorporates both online instruction and traditional instruction in the same course. Students are involved in a limited number of regular scheduled class meetings where the student and teacher are located at the same place at the same time. The remainder of the course instruction occurs online using a LMS and the Internet.

• **Face-to-Face Interaction**: Interaction that occurs between students or between students and instructors to aid in the understanding of course design or content.
• **Attitude**: The emotional response or general feeling (positive, negative, neutral) students develop toward the learning strategy (cooperative learning) in each type of instructional setting (traditional, online, and hybrid).

• **Perception**: The way students feel that a particular learning strategy (cooperative learning) affected their overall view and understanding of content in a particular course.

• **Quality of Product** – “the perceived academic benefits of working with other students, as expressed by the quality of work produced, ease and enjoyment of material, liking to help others, and more improved learning” (Kouros & Abrami, 2006, p. 13).

• **Peer Support** – “the personal support students give and receive when working in groups. The degree of student support as expressed by respecting each others’ opinions, feeling liked and involved with the group activities, and feeling valued as group members” (Kouros & Abrami, 2006, p. 13).

• **Student Interdependence** – “the degree to which students contribute to the group process and product, there is equal participation, and evaluation depends on the grade of other members” (Kouros & Abrami, 2006, p. 14).

• **Frustration with Group Members** – “the frustrations experienced when working with less academically competent members, disliking the assigned group members, and wanting to work with friends” (Kouros & Abrami, 2006, p. 14).
Justification of Study

Advances in technology and the growing size of institutions have stimulated the growth of the nontraditional classroom. Nontraditional classrooms take advantage of technology, especially the Internet, to deliver content information to students. This allows institutions to offer more courses to more students with less concern for class size, classroom space, and instructor schedules. Currently, online and hybrid instruction are being utilized as nontraditional classroom settings.

A great deal of research exists that proclaims the positive effects of cooperative learning in a traditional classroom setting (Krathwohl & Yarger, 1985). However, very little research has addressed cooperative learning in a nontraditional classroom setting. Johnson, Johnson, and Smith (1991) identify face-to-face interaction as a necessary component for cooperative learning to be successful in a college classroom. With nontraditional instruction, face-to-face interaction is limited or nonexistent dependent on the method (hybrid or online). In this research, I seek to determine if and to what extent cooperative learning can be successful with limited or no face-to-face interaction.

The effects of cooperative learning have been measured in multiple studies throughout the last twenty-five years of educational research. Little evidence, however, exists that describes how students feel about the use of cooperative learning in their classes (Phipps, Phipps, Kask, & Higgins, 2001). I will describe attitudes and perceptions that students have toward cooperative learning in each different educational setting and allow instructors to evaluate
potential concerns about using cooperative learning. The conclusions drawn from this research will aid college instructors and administrators in the development and design of nontraditional classes to meet the needs and concerns of a growing higher education population.
CHAPTER II

REVIEW OF RELATED LITERATURE

Cooperative Learning

Cooperative learning is defined by Johnson, Johnson, and Holubec (1994) as “the instructional use of small groups through which students work together to maximize their own and each other’s learning” (p. 1:14). It has been used throughout history and all over the world. It has roots in several psychological and philosophical ideals. A variety of methods has been established and provides several different options for classroom implementation. It has become a popular method of instruction over the past century because of its benefits for learning, socialization, and psychological health. Hundreds of studies have been conducted on cooperative learning implicating it as an instructional method worthy of attention.

Historical and Theoretical Perspectives

Cooperative learning and student-centered instruction may be as old as formal education itself. Educators such as Confucius and Socrates emphasized curricula that focused on the learner, rather than the subject (Henson, 2003). But Confucius and Socrates did not have to contend with administrators, budget constraints, and disinterested students. These great philosophers saw the importance of experience in the education of students. In the seventeenth century John Locke also saw this importance and introduced the concept of experiential education. Educators in Switzerland such as Rousseau and
Pestalozzi agreed, and with that came the first learner-centered schools in the late eighteenth century.

Cooperative student-centered learning, in America, dates back to the mid 1800’s and the Common School Movement where it was widely used to meet the educational goals of the time (Johnson, Johnson, & Smith, 1991). Colonel Francis Parker began working in education, after the Civil War, serving as principal in several schools and providing demonstrations of the new student-centered curriculum that was so successful in Europe. His school emphasized treating students as individuals with different needs. Drill and practice activities were replaced by inquiry. Parker, during this time, had the privilege to work with John Dewey who is perhaps one of the most influential Americans in the areas of education and philosophy (Henson, 2003).

John Dewey advocated student learning based on their individual interests and experience. He stated that “when we experience something we act upon it” (Dewey, as cited in Sutinen, 2008, p. 6). Dewey promoted active, rather than passive, learning to meet students’ needs. He also recognized that students have both a psychological and social dimension, and both of them must be serviced for education to be successful. Dewey, sometimes called the founder of Progressive Education, sought to bring authentic learning experiences to students (Sadker & Sadker, 2000). He thought education should be as much like adult life as possible. It should prepare them to live in a democratic society and function as productive citizens, citizens who could think critically and exchange ideas openly with others (Sharan & Sharan, 1992). He felt that learning should
be problem-based and fun, in order to cause intrinsic motivation for students to learn. The problems, Dewey felt, should be dealt with in a cooperative manner with students working together. He believed that “the only way a child would develop to its potential was in a social setting” (Henson, 2003, p. 9).

Dewey and Progressive Education received a great deal of criticism. Many felt that students were not achieving as much as they should with this type of curriculum. This was only exacerbated with the launch of Sputnick in 1957 by the Soviet Union. Fear of falling further behind in the “Space Race” pushed Americans to revert back to the traditionalist method of instruction which emphasized drill and practice and rote learning. Cooperative learning continued, at least to some extent, in the mid twentieth century and increased as research was conducted to prove that students were achieving just as much and more using the cooperative learning model (Pulliam & Patton, 2003).

Cooperative learning, and research on its contribution to education, are grounded in several theoretical perspectives. Among these are the cognitive developmental perspective, the behavioral learning theory perspective, and the social interdependence perspective (Johnson & Johnson, 1994).

*Cognitive developmental perspective*. The cognitive developmental perspective is based largely on the theories of Social Developmental Theory by Lev Vygotsky and Cognitive Development Theory by Jean Piaget. The developmental perspectives of both Vygotsky and Piaget have several contradictory points, but they both agree on aspects related to cooperative or peer learning and the constructivist theory. Constructivism is the belief that
knowledge is constructed and built upon already existing information (Weld, 2004). Constructivists, in general, focus on interactions among students (Henson, 2003). These psychologists see the importance of interactions between the environment and other individuals for children to construct meaning. It is through these interactions that they are able to make sense of things and learn.

Lev Vygotsky introduced his Social Development Theory in the early twentieth century. His ideas focused on development based on interaction between children and their social environments (Leong, 2001). He believed that if children were withheld from social interactions they would not develop as they should. He observed students working together to solve problems. Students assisted one another during their interaction and solved the problem more effectively than if they had worked alone (Henson, 2003). Vygotsky is also noted for his development of the Zone of Proximal Development (ZPD). This zone refers to “the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult supervision, or in collaboration with more capable peers” (Bransford, Brown, Cocking, Donovan, & Pellegrino, 2000, p. 81). Vygotsky acknowledged that peer assistance and cooperation can have a big impact on the cognitive development of an individual.

Jean Piaget, on the other hand, viewed development in a more intrinsic fashion. His research was more focused on how the individual interacts with nature and other objects to initiate understanding. The Theory of Cognitive Development states that children develop in stages. They actively move through
each cognitive stage seeking to make sense of the environment surrounding them (Bransford et al, 2000). From this theory comes the acknowledgment that “when individuals cooperate on the environment, sociocognitive conflict occurs that creates cognitive disequilibrium, which in turn stimulates perspective taking ability and cognitive development” (Johnson & Johnson, 1994, 39). Piaget suggested that cognitive development is stimulated by peer interactive experiences (Fore, Riser, & Boon, 2006.). It is through social interaction that students can see inconsistencies in their own ideologies and amend them. This interaction, then, becomes essential for cognitive development.

*Behavioral learning theory perspective.* The behavioral theory perspective is equally important in the theoretical framework of cooperative learning. B. F. Skinner, a leading behaviorist, “believed that children could be conditioned to acquire desirable skills and behaviors” (Sadker & Sadker, 2000, p. 309). His research included several experiments where he conditioned animals to behave in certain ways. The idea was that if students were rewarded for working cooperatively they would continue to do so. Slavin (1988) indicates that group goals are essential to cooperative learning. Students would work together to reach these group goals because they would be rewarded for attaining them.

*Social interdependence perspective.* The social interdependence perspective is probably the most exclusively linked to research in cooperative learning. “The premise of this theory is that the way in which goals are structured determines how individuals interact, which in turn creates outcomes” (Johnson, 2003, p. 934). This theory was introduced by Kurt Koffka in the early twentieth
century. He proposed that the interdependence among group members can differ and in turn change the way the group acts as a whole. This idea was taken one step further by Kurt Lewin in the 1920s. He added to this theory stating that any change in the dependence of a group member would change the entire group. He suggested that the group was made interdependent by common goals, and the pressure to reach those goals was what motivated cooperation among group members (Johnson, 2003).

The middle of the twentieth century saw Morton Deutsch become the third important contributor to this theory of interdependence. Through observation of students, he noted two specific types of social interdependence: positive and negative. Positive Interdependence, he states, results in a positive correlation between individual goal achievement and group goal achievement. If one student is successful, the other students can be successful. Students in this state of interdependence are cooperating. A student can meet his goal, if and only if, the other group members meet their goals. Negative interdependence results in a negative correlation between individual and group goal achievement. If one student is successful, the other students cannot be successful. Therefore, a student can meet his goal, if and only if, the other students fail to meet their goal. These students are in a competitive state. Deutsch also noted that if no interdependence is present, then no correlation between individual and group goal attainment exists. The attainment of one group member has no effect on the attainment of other group members. This represents the individualistic approach to learning (Johnson, 2003).
Work by Deutsch was continued by one of his graduate students, David Johnson, who with his brother Roger Johnson, developed what is now known as the Social Interdependence Theory. Johnson and Johnson have conducted a great deal of research on social interdependence and cooperative learning. They have included it as one factor essential for effective cooperative instruction. They recently investigated social interdependence and cooperative learning as important topics in education and the focus of research, much of which stems from the Cooperative Learning Center at the University of Minnesota (Johnson, Johnson, & Smith, 1991).

**Essential Elements**

A few important elements must be present for cooperative learning to be successful. Kagan (1994), Slavin (1995), and Johnson and Johnson (1994) agree that two of these elements are positive interdependence and individual accountability.

Positive interdependence can be described as a mutual relationship where each group member needs the others to succeed. It refers to the positive correlation between the goals of one individual with the goals of another. This creates a motivating force within each group to succeed. It also creates the “sink or swim together” mentality (Johnson, Johnson, & Smith, 1991, p. 1:19).

Students are encouraged to help each other master topics in order to reach the group goals. Kagan (1994) acknowledges the need for varying levels of positive interdependence within each group. In weak forms, success of one member is likely to lead to success of another. This contrasts with strong forms in that
success for individual team members is not possible unless all group members succeed. A balance must exist between forms of interdependence; otherwise, students are likely to become frustrated and the team effort damaged.

Individual accountability, the second essential component, is necessary because it prevents the “freeloading” situation often associated with group work. Students are expected to contribute to the group and master the skills being taught. They cannot rely on other group members to do the work for them. Individual scoring as well as group scoring should be built into each cooperative learning module. Individual accountability and personal responsibility require that each group member does his fair share of the work. Members of the group should be given a specific job to complete, and other members should hold them accountable. The learning group should not be a place for free-loading. Without this type of environment, no academic achievement can occur (Slavin, 1995).

Johnson, Johnson, and Holubec (1992, 1994) and Johnson, Johnson, and Smith (1991) identify face-to-face promotive interaction, interpersonal and small group skills, and group processing, in addition to positive interdependence and individual accountability, as essential components to cooperative learning.

Face-to-face interaction is facilitated by positive interdependence. If all must be successful, then group members must help each other find that success. This provides a trusting, encouraging, working relationship between members of each group. It is essential that group members “meet face-to-face to work together to complete assignments and promote each other’s success” (Johnson
This interaction builds rapport among the students to enable them to facilitate achievement for their fellow group members. Interpersonal and group skills are essential to a well functioning cooperative group, as well as, any other working environment. Students must be able to communicate with each other without derogative or overly critical responses. Group members must feel free to speak openly without fear of ridicule. They must learn to build on the ideas of others and use that information to enhance their own thoughts. These skills are valuable to students as they move into the work force and begin dealing with people outside of their educational facilities. Many of the world’s largest organizations could not function without individuals who can effectively communicate and cooperate with others.

The necessary element, group processing, requires group members to reflect on their group communication by analyzing its productive and nonproductive aspects. Groups must take this reflection and use it to make subsequent group meetings more beneficial (Johnson, Johnson, & Holubec, 1992). If students never provide one another with feedback on how the group is functioning, it will become stagnant. The goal is that over time, the group should continually improve in its ability to work together. It is through this element, group processing, that this goal is accomplished.

Kagan (1994) also identifies two other essential conditions to cooperative learning: equal participation and simultaneous interaction. It is important when working in a group that each participant be assigned equal portions of the work. This must be deliberately attended to and will not occur by chance. Not only in
class work is this important but also in discussions. If one student controls fifty percent of the conversation and the other three members make up the remaining fifty percent, this is not equal participation. Each student should be allowed equal input and time to voice their opinions on the topics being addressed.

Simultaneous interaction refers to the number or percentage of students interacting at any given moment. This number should be high if cooperative learning is to occur. Each student should be actively engaged in the group activity throughout the session. Actively and equally participating students in each group meeting provides an environment conducive to cooperative learning.

Methods

Several methods of cooperative learning have been developed over the last century. Each method has its own unique attributes for enhancing student learning. Some of the more well-known practiced and researched methods will be discussed in the following section.

One of the first methods of cooperative learning to be developed was Jigsaw. This method was devised by Aronson and includes using groups of three or more members (Kirk, 2001). Jigsaw refers to the ability to put all the individual puzzle pieces together in order to see the entire picture. In this method, the topic is divided into subunits and assigned to each group. The group then divides the subtopics further so each group member has some piece of the puzzle for which they are responsible. Once group members are comfortable with their information, they are to report back to the group and teach the information to the other members. Evaluation though individual tests and quizzes are common with
this method. Group members receive as a score the average group score. This serves as motivation to ensure each group works hard to make every member successful (Kirk, 2001).

Robert Slavin, one of the leading researchers in the area of cooperative learning, identifies Student Team Learning as an effective method for cooperation. This method was developed and researched at Johns Hopkins University and focuses on equal opportunities for success for all students (Slavin, 1991). This type of design allows students of all ability levels are given the opportunity to succeed. Grades or points are awarded based on improvement from previous achievement rather than percent correct. Students, in this method, are competing against themselves rather than other students.

Slavin’s (1995) book *Cooperative Learning: Theory, Research and Practice* describes three general Student Team Learning methods: Student Team – Achievement Divisions (STAD), Teams – Games – Tournaments (TGT), and Jigsaw II. Each of these includes a heterogeneous group of four students. In STAD and TGT, each unit follows a cycle of instruction, cooperation, and evaluation. Cooperation is preceded by a teacher-centered lesson on the topic to be addressed. During the cooperation period, students meet in their groups and teach, review, or study the material with one another. STAD evaluation is accomplished through individual quizzes. Teams are not allowed to work together during the quizzes. The group score is determined through summation of individual group member scores. TGT evaluation occurs through tournaments. Individual group members compete with members from other groups who share
their ability level. Equal numbers of points are awarded for winning the
tournament regardless of the ability level of the students in each match. Jigsaw II
is a somewhat different strategy adapted from the original jigsaw technique. Each
group of students is assigned a particular component of the lesson, story, or
other activity. The students are then to become experts on this area. They will
encourage members of other groups who have the same topic to fine tune their
understanding. Each group member then reports back to their group to teach the
other students. Evaluation occurs through individual quizzes; scores are
determined in the same manner as STAD (Slavin, 1995).

The Learning Together Model, developed and implemented by David and
Roger Johnson, directors of the University of Minnesota Cooperative Learning
Center, is yet another successful form for cooperative learning. It is set apart
from other methods in its explicit teaching of social skills and team building
activities. This method also focuses on individual roles for each member and
group reflection. Student groups are scored based on a single evaluation
completed and submitted as a group without individual quizzes or tests (Kirk,
2001).

Johnson, Johnson, and Holubec (1993) identifies four types of cooperative
learning groups in their Learning Together Model: formal cooperative learning
groups, informal cooperative learning groups, cooperative base groups, and
cooperative learning scripts.

They define a formal cooperative learning group as one used to teach a
specific topic. The teacher in this situation determines group size and makeup.
She, then, teaches the concepts, principles, and strategies necessary for effective group cooperation. The teacher then assigns the group activity and is available to intervene if help is needed.

An informal cooperative group is just as the name indicates “informal.” Student groups converge for very short periods of time throughout the lesson to clarify or summarize lecture topics. This type of group can also be used for short beginning or end of class activities.

The cooperative base group is a much more permanent group lasting from one to several years. These groups are designed to provide support and assistance on various issues for members. They meet daily to weekly and have been found to improve attendance and the overall school experience for many (Johnson, Johnson, & Holubec, 1992).

The last type of group, cooperative learning scripts, are used for generic or routine activities. For example, this type of group could be effective for small presentations, checking homework, or reviewing for a test (Johnson, Johnson, & Holubec, 1993).

Elizabeth Cohen of Standford University has also been acknowledged for her approach to cooperative learning, Complex Instruction (Kirk, 2001). Cohen’s method includes a group of five to six members with varying ability levels. A series of activities are developed around a central theme. Activities are designed to foster skill development and knowledge application. The main goals of this method, however, involve status and multiple ability treatment within each group.
This cooperative method allows students to learn to appreciate and to respect others' talents and contributions to the group (Cohen, 1994).

Group Investigation is an inquiry-based cooperative learning method. Developed by Yael and Shlomo Sharan, this method requires four I’s for success: investigation, interaction, interpretation, and intrinsic motivation. Investigation refers to the orientation to inquiry, preparing the students to continue through this cooperative process. Interaction accounts for the social aspect of the model where students come together and discuss investigations. Interpretation occurs both on the individual level and the group level as students seek to make sense of their investigations and observations. The goal, throughout this process, is to develop intrinsic motivation for students to want to find information and understand the concepts under investigation (Sharan & Sharan, 1992).

Several other methods of cooperation have been developed and implemented including many informal models by Spencer Kagan as discussed by Kirk (2001). Numbered Heads Together is just one of many successful strategies in this collection. In this method, the teacher numbers off the students in each group one through four. She then assigns a question or problem and tells the students to get their heads together to make sure everyone knows the answer. She will then call on a number to answer and only that group member can respond for the group. Think-Pair-Share is also another popular model from this collection. In this activity, the teacher poses a question, and the students individually try to determine the answer. They are then allowed to pair up with
another student and deliberate on the answer. Once the period of cooperation has ended, students are asked to share their answer with the teacher and other students (Kagan, 1994).

**Benefits**

Regardless which of the many successful methods used, several benefits can be gained from a cooperative learning environment. The range of benefits can be divided into three different categories: intellectual, social, and psychological. Intellectual refers to the actual outcomes as they relate to mental abilities. Social refers to the benefits that help students respond in social environments and as a member of society. Psychological benefits are those that improve the psychological health and personal impression of oneself.

The intellectual benefits are probably the most well studied and documented. Numerous studies document an increase in student achievement as a result of cooperative learning (Slavin, 1988). Researchers also claim the improvement of student attitudes when exposed to this type of learning environment (Vaughan, 2002). Students, during cooperation, are required to look more closely and discuss issues. This leads to improved critical thinking skills, creative problem solving, and an increase in the usage of high order thinking skills. Cooperative learning provides an opportunity, especially for students who may not be as advanced, to improve basic educational skills and oral language proficiency (Cohen, 1994). Cooperative learning also provides an opportunity to help teachers address and conquer classroom management issue. This method allows teachers to manage instruction for a wide range of learning abilities with a
single activity. Classroom behavior is less of a problem and the amount of time on task increases (Slavin, 1995; Johnson & Johnson, 1994). Students exhibit an intrinsic motivation to learn and greater retention and understanding of information with cooperative learning. (Sharan & Sharan, 1992).

Not only does cooperative learning provide a large number of academic benefits, but also several social benefits are documented. Cooperative learning provides students with the interpersonal skills necessary for working in groups. The value of being able to work effectively in a group is very important. This is a skill deemed vital to a majority of work force employees. Cooperative learning provides students an opportunity to learn how to understand other individuals’ perspectives and support them. It provides a situation of cooperation, cohesion, and social support necessary for a well functioning group (Slavin, 1995). Use of this instructional strategy teaches tolerance and compassion for individuals who may appear different. Cooperative learning can improve race relations and acceptance of handicapped in the classroom (Johnson, Johnson, & Holubec, 1994.)

The benefits cooperative learning can provide for the individual’s psychological health creates hope for students who suffer from alienation in the school setting. Research indicates that students who participate in cooperative learning experiences like their school, their classes, and their classmates more than those in a traditional setting. Students exhibit a feeling of belonging and of being liked by their classmates. Students also indicate a higher self esteem and
ideology about one’s self when involved in this learning method (Slavin, 1995; Johnson & Johnson, 1994).

Current Research

Cooperative Learning has been part of the American educational system since the beginning of twentieth century; however, classroom research on cooperative learning did not occur until the 1970’s. Research was basically conducted at that time by four distinct groups (Williams, 1996). The four main groups of researchers were headed by Elliot Aronson in California, David and Roger Johnson in Minnesota, Robert Slavin and David DeVries in Maryland, and Shlomo Sharan in Israel. Today, cooperative learning is considered a research success story. “During the past 90 years over 575 experimental and 100 correlational studies have been conducted by a wide variety of researchers, in different decades with different subjects, in different subject areas, and in different settings” (Johnson, Johnson, & Smith, 1991, p. 2:2). More than one hundred of these studies have attributed to cooperative learning the success of improving learning outcomes and developing social values (Leming & Hollifield, 1985).

Much research has been conducted regarding the effect of cooperative learning on student achievement. Johnson, Johnson, and Holubec (1992) report that as a whole, cooperative learning, if implemented correctly, can and will increase student achievement. A study conducted on the effect of using cooperative learning to enhance achievement in physical science showed that 94% of students surveyed indicated that the group activities improved their ability
to solve problems. Of the same group polled, 89% reported a deeper understanding of the concepts and 83% reported an improvement in problem solving skills (Gupta, 2004).

One question that must be answered regarding cooperative learning is who is learning? Is it the high achievers, the low achievers, or those in the middle? Research reported by Shachar (2003) indicates that all of these students benefit from cooperation. The level of benefit varied, but they all showed improvement. Those students who were the highest achievers had the lowest degree of improvement, followed by the middle group who had a somewhat higher degree of improvement. The low achievement group showed substantial improvement from the cooperative learning activities.

Research by Vaughan (2002) also indicates that cooperative learning can be an effective teaching tool for use with minority students. Cooperative learning, when used in this setting, has been reported to increase motivation and success in the classroom. Cooperative learning may be a way to meet the needs of multicultural students in a world filled with diversity.

Researchers Hanze and Berger (2007), like Vaughan (2002), found an increase in intrinsic motivation of students in their study of twelfth grade physics students. Their study consisted of a quasi-experimental comparison of cooperative learning and direct instructions. In addition to intrinsic motivation, Hanze and Berger also found increase in autonomy, overall competence, and social relatedness. Those students who reported an increase in overall
competence also exhibited higher academic performance in the physics evaluations.

The Howard Hughes Medical Institute is also using cooperative learning activities as part of their curricula. Instructors are using team challenges as a way to enhance students' individual performance and allow them participate in "real science." Students in this setting were required to work together to develop a working model of a specific protein. “The team challenge exercise forces students with different expertise to collaborate and helps them break down sociological barriers and form functional social networks” (Derisi, 2008, p. 8). Instructors found that, after participating in the team challenge, students performed better, asked more questions, and helped each other more than those who did not participate in the challenge.

Despite the quantity of research articles addressing cooperative learning, few of them focus on large scale classrooms. A recent study by Armstrong, Chang, and Brickman (2007) evaluates the use of cooperative learning in an introductory biology course with more than 250 students. Their research indicates that cooperative learning is effective in a large class with the students using this method scoring significantly higher than the control group on gain scores from pre-test to post-test. The cooperative learning group also maintained a higher attendance average than the control group.

Class Structure

The structure of a class or how a class is organized can play a tremendous role in the quality of instruction and the learning atmosphere for
students. With the increase in technology, the way teachers teach and learners
learn is changing (DeNeui & Dodge, 2006). I will describe three different class
structures: traditional, online, and hybrid. Within these structures, the general
methodology, advantages, and disadvantages will be discussed.

Traditional Instruction

Traditional education can be described as instruction that occurs on a
regular schedule in a classroom, lecture hall, or laboratory. Face to face
interactions, both student-to-student and student-to-teacher, are an important
characteristic of this class design. Instruction can be teacher-centered where the
teachers are the focus of each session. Their job is to disseminate the content to
the students and assist them in constructing meaning (Al-Khanjari, 2005).
Passive instruction can occur with this strategy. Students’ understanding is
limited to knowledge level and responses are reactive rather than proactive
(Weld, 2004). Instruction in this setting may also be student-centered where each
individual student is responsible for obtaining and dispersing content information
within the class. Student-centered learning may include both individual and group
assignments. Student learning is active, and the students are responsible for
their own construction of knowledge. This fosters the use of critical thinking skills
important to student achievement. In actuality, a traditional classroom will include
some degree of both student and teacher centered instruction (Mansour &
Mupinga, 2007). This balance allows for the greatest degree of quality instruction
taking into account faculty and time constraints.
Several advantages exist for conducting class in a traditional manner. Students are scheduled to meet at a particular time. During this time, they have the opportunity for direct interact with the instructor and other students. They are able to enter into discussions with one another and ask questions, all of which can help them as they seek to further understand the material. This is especially important to students who desire more than the average amount of assistance given to each student.

There are, however, disadvantages to the traditional instruction. Student and instructor must be located in the same room at the same time. This puts a time constraint on both the instructor and the student. This can be a problem, especially for nontraditional students who are trying to manage class schedules while working full time. There also is a lack of flexibility. Students are required to “keep up” with the class schedule and do not have the freedom to learn at their own pace (Mansour, 2007).

**Online Instruction**

With the increase in technology, online instruction has become increasingly popular in higher education. For the purpose of this research, online instruction can be defined as a type of distance learning where instruction occurs entirely through the Internet with no regular scheduled class meetings (Learning in the 21st Century, 2007). A recent study of consumer attitudes toward online education indicated that 77% of prospective college students were interested in taking online courses (Eduventures, 2005). This provides valuable information
Online courses generally use some type of course or learning management system. They are the most common means for designing and delivering information in an online course (Roblyer, 2006). A course management system “includes software for the creation and editing of course content, communication tools, assessment tools, and other features designed to enhance access and ease of use” (Learning in the 21st Century, 2007, p.2). One popular system is Blackboard. The Blackboard Learning System is designed to enhance teaching and learning through course organization and a means to facilitate student interaction. This software allows the instructor to accomplish several goals necessary for quality instruction including the following: (1) use a variety of tools to create a meaningful learning content, (2) encourage students to work in groups and interact with one another, (3) stimulate critical thinking skills through use of interactive tools, (4) facilitate student communication and cooperation, and (5) evaluate student progress using a variety of assessment strategies (Blackboard, 2008). Blackboard can also serve as an important organizational tool to manage paperwork and grading especially for instructors who teach multiple courses (Lang, 2007).

Online courses, especially those equipped with systems like Blackboard, can provide several benefits for students, as well as instructors and college administrators. Online education permits students to pursue degrees who may never have been able attend college otherwise. Students who were once
prevented from furthering their education due to family or work obligations, time constraints, or distance are now enrolling in online courses. These courses allow flexibility, and students can complete coursework at their own pace and convenience (Wyatt, 2005). Online education facilitates an entirely student-centered curriculum where the student is responsible for constructing his own learning. Learning is active, and therefore, promotes the use of higher order thinking skills (Weld, 2004). If designed correctly, online courses can encourage peer interaction. With the use of a discussion board or forum, students are given more time to consider their replies and provide quality responses to questions that may sometimes be absent from an in-class discussion (Smith, 2003; Wyatt, 2005). Students also indicate a greater sense of motivation in online courses when compared to traditional courses (English & Yazdani, 1999).

Instructors benefits from online instruction in that they provide individualized attention for each student. This learning environment allows the instructor to tailor individual or group assignments to meet the individual need of the students. Instructors also have the ability to track each student’s progress and monitor their improvement with ease (Smith, 2003). Instructors, in this setting, can teach a larger number of students because they are not as limited by classroom size (Beard & Harper, 2002). Assignments, announcements, and lecture materials can be posted for students to view at their leisure, and instructors are not tied down by having to organize and conduct a regularly scheduled lecture. They are free to accomplish other tasks important to campus development.
Benefits of online instruction extend upward from students to instructors to administrators. College administrators, through online courses, can provide education to a new class of students. This provides a potentially prosperous advantage for growing universities and colleges. Online instruction can be a very economical option for small institutions. It allows more classes to be offered using very little classroom space (Bickle, 2003).

Despite all the advantages discussed, online instruction does have some disadvantages. Students often feel classes are less personal and lack the degree of socialization necessary to learn. They are also less effective for students who learn best through direct interaction (Beard & Harper, 2002). Probably the greatest concern with regard to online instruction is the need for moderate to advanced technological skills in order to be successful. This is especially a problem for students who are not computer savvy.

*Hybrid Instruction*

Hybrid Instruction can be defined as a combination of online and traditional instruction where students participate in some traditional classroom experiences throughout the course duration and complete the remainder of the course online. Hybrid instruction may also be referred to as blended, web-assisted, or web-enhanced instruction (Mansour, 2007). Hybrid instruction may provide an alternative for students who lack the technological “know how” to be successful on their own and need the flexibility offered by online courses. A survey of prospective college students noted that 85% of those surveyed were interested in hybrid education. In the same survey, 56% of college students
under 25 stated that they were more likely to consider a hybrid course than an entirely online course (Eduventures, 2005).

Hybrid instruction alleviates several of the disadvantages associated with online and traditional instruction. This environment can lead to more engaging learning experiences. Teachers are now given the ability to “accommodate every learning style and capture students’ attention” (Pape, 2006, ¶ 10). It provides a setting where students who require face-to-face instruction and students who learn better individually both have an opportunity to be successful. All students given are initially introduced to the material outside of class, so that class meetings can be a time of discussion, clarification, and reflection. Students who are having technological difficulties can speak with the instructor, and they can work through issues together. Hybrid instruction allows for the “real interaction” that is absent from fully online learning (Mansour, 2007).

Hybrid Instruction does have some disadvantages. Students will have to meet some classes on campus and some classes completely online. This causes concern for students who prefer strictly traditional or strictly online courses. This type of instruction, however, is more flexible than traditional instruction in regard to class meeting and time constraints. It also shares the economical benefits associated with online instruction (Mansour, 2007). Hybrid Instruction provides a “happy medium” between the two more extreme methods. In the future, it will be essential to meet the needs of the growing university population.
Attitudes and Perceptions

In several studies, attitudes and perceptions of students have been utilized as an effective measure of success for an instructional method (Peterson & Miller, 2004; Gupta, 2004; Armstrong, Chang, & Brickman, 2007; Hanze & Berger, 2007). When looking at attitudes and perceptions as a measurement tool, there are several variables to consider. (1) Is the method being evaluated a new method to the students? Even though cooperative learning has a reputation for improving the educational experience, students are often apprehensive about it when it is initially introduced in the classroom (Phipps, Phipps, Kask, & Higgins, 2001). (2) Have students been involved in unsuccessful group activities prior to the experience to be evaluated? Often, students who have participated in group activities have experienced issues like “freeloading.” For this reason, they possess a negative attitude toward cooperative learning that carries over into the new experience. (3) Is this the learning method expected by students? Students, especially college students, have a preconceived notion of what college instruction is supposed to be. They expect a teacher-centered atmosphere where they are lectured to and expected to learn the information. Many do not expect to encounter a learner-centered, problem-solving, and student interactive atmosphere.

The factors affecting student perceptions listed previously can create a barrier for some university or college instructors interested in implementing cooperative learning into their class instruction. Students may perceive cooperative learning as being ineffective or unsuccessful because it was not
what they expected to be doing in that particular course. They may insist that they do not like it because it was more work than they thought it was going to be or should be. These attitudes and perceptions could have a negative impact on the instructor’s evaluation and reputation with the students. Instructors without tenure are especially vulnerable to poor evaluations and may, therefore, be resistant to utilize cooperative learning despite its documented success for educating (Phipps, Phipps, Kask, & Higgins, 2001).

These are some important issues that need attention if the experience is to be successful for both the teacher and the student. “Implementing effective cooperative learning that results in improved teaching evaluations is a very complex, dynamic process requiring a constant ‘temperature reading’ of the students’ perceptions” (Phipps, Phipps, Kask, & Higgins, 2001, p. 15). Instructors must continuously monitor and adapt the instruction to accommodate changing attitudes of students. Institutions can also aid in this transition from teacher to student centered or cooperative college classrooms by supporting their faculty during the implementation phase. Evaluations may be lower even though academic achievement is increasing. Students may be learning more, but that does not mean they will like the extra or different kind of work they are being required to complete. Institutions should also provide adequate training for faculty to help them develop and amend their classes to ensure the greatest quality of instruction for their students.
Conclusion

Cooperative learning involves using specially designed groups with distinct goals to improve learning for all students involved. It has been used throughout history to improve academic achievement and social skills. “The use of cooperative learning remains a recurring theme in recommendations for science education, and numerous studies have documented its effectiveness in the traditional classroom” (Lumpe, 1998, p. 1). With the growing populations of students both traditional and nontraditional, the variety of instructional methods is increasing. More and more classes are being offered online or in the hybrid format. The effectiveness of cooperative learning in these environments is yet to be measured. Positive student attitudes and perceptions toward cooperative learning in traditional, online, and hybrid instruction are essential to creating an institution that promotes this type of active instruction for student success.
CHAPTER III
RESEARCH METHODOLOGY

The methods used to collect and analyze data will be described in this chapter. The chapter will include a description of the subjects, the instrument, the research design, and the method of data analysis. A description of the designs for cooperative learning in the traditional, online, and hybrid courses will also be provided. The purpose of this study was to determine the attitudes toward cooperative learning as well as achievement using cooperative learning in a traditional, online, and hybrid class setting. I also sought to determine if there was a significant difference in the attitudes and achievement among the three course designs. The specific research questions are as follows:

- What are the attitudes and perceptions of cooperative learning administered in traditional, online, and hybrid instructional settings?
- Is there a difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional setting?
- What are the levels of achievement for students using cooperative learning in traditional, online, and hybrid instructional settings?
- Is there a difference in achievement level of students using cooperative learning in a traditional, online, and hybrid instructional setting?
Research Hypotheses

- **Research Hypothesis 1:** There is no statistical difference in the overall attitudes and perceptions of cooperative learning in a traditional, online, and hybrid instructional setting.

- **Research Hypothesis 2:** There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional setting based on quality of product and process.

- **Research Hypothesis 3:** There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional settings based on peer support.

- **Research Hypothesis 4:** There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional settings based on student interdependence.

- **Research Hypothesis 5:** There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional settings based on frustration with group members.

- **Research Hypothesis 6:** There is a statistical difference in pre-test and post-test scores for the traditional setting.

- **Research Hypothesis 7:** There is a statistical difference in the pre-test and post-test scores for the online setting.

- **Research Hypothesis 8:** There is a statistical difference in pre-test and post-test scores for the hybrid setting.
• Research Hypothesis 9: There is no statistical difference in achievement level of students using cooperative learning in a traditional, online, and hybrid instructional settings.

Course Design

The courses in this study were carefully developed to include a meaningful cooperative learning experience intertwined with regular instruction. This task posed many challenges especially in developing cooperative learning in class settings where it was not already established. This was the case in the online setting. Great care was taken to create an equivalent cooperative learning experience in each of the three settings to make this comparison as valid as possible. In each setting, students were involved in several one to two week long cooperative projects. Members of each were assigned a specific task to complete. The task in all three settings involved the completion of a concept map using information previously studied by the students. The concept maps were created using a computer program called Visual Understanding Environments or VUE. This program created by Tufts University and was available free of charge for the students. The software was continuously being updated by the university. Students used the most current version of the software available during each particular semester (VUE, 2010). The VUE computer program allowed concept maps to be created in a digital format that could be accessed online or a paper version that could be utilized in a traditional setting. With VUE, students can create concept boxes and add aspects or notes to each concept box. They could also add links which show the connection between different aspects. The group
goal of each activity was to complete an assigned concept map using VUE. Prior to beginning the activity, students completed an individual map that allowed them to learn how to manipulate the VUE software. This tutorial prevented the detail of the software from hindering the investigation. A description of this activity can be found in Appendix K. The specifications for each activity are described below.

Traditional Setting

Principles of Biology I and II were taught using the traditional class setting. Students enrolled in these courses met regularly scheduled class meetings. Meetings consisted of teacher-centered lectures, class discussions, and cooperative learning activities. Students were required to take five unit tests throughout the course of the semester. They were also required to complete five concept maps in small four to five member groups. The groups were selected by the students. Concept maps reflected the same information that was assessed on each unit test. Each group of students was given a blank concept map, and they were required to “fill in the blank” with the correct concept or note. They were also to provide links that showed the relationship between different concepts. The teacher monitored the group interactions to ensure quality work, equal participation and cooperation among group members. She intervened when necessary to keep students on task. Students then submitted the completed map and received a group grade for the assignment.

Online Setting

This setting was much more difficult to develop because there were no existing models with which to work. This setting also posed a challenge with the
lack of face-to-face interaction among students. This model was very carefully
designed to promote cooperation when students had no physical contact with
each other. This was accomplished through the use of the Blackboard Learning
System, specifically webmail and discussion boards.

History of Biology was the course taught using this design. The online
course was designed with weekly quizzes and no cumulative examinations; and
the course content was divided conveniently into four sections for cooperative
learning exercises. This activity consisted of completing a concept map on
material previous studied by the student. Each student in the group was assigned
a portion of the map to complete. Students self selected into groups at the
beginning of the semester. They interacted within these groups and exchanged
information using a group discussion board that was open only to members of
that specific group. A group assembler was selected by the group to manage and
ensure that the individual maps were assembled and submitted by announced
deadlines. There were no set times for students to meet on the discussion board;
so, work on the map was done at each student’s convenience. Each student was
required to critique each other group member’s work. This ensured cooperation
among students during the activity. Students received a group grade for the
completed concept map, as well as an individual grade for cooperation. Group
monitoring was essential to the success of cooperative learning online. The
teacher monitored each group’s discussion boards and facilitated communication
between members as needed. Instructions for the online cooperative activity can
be found in Appendix L.
Figure 1. Online cooperative learning activity. This figure illustrates the steps of the online cooperative learning activity.

Hybrid Setting

Both History of Biology and Principles of Biology II were taught using the hybrid method. The cooperative learning activities in the hybrid setting were similar to cooperative learning in the traditional setting. The hybrid setting did allow for face-to-face interaction to occur. Therefore, students worked in cooperative groups that they created during the regular class meetings. Any extra communication between members occurred on the group discussion board or via email. The activities for these two courses were slightly different.

In the hybrid version of History of Biology, students were to complete weekly quizzes with no cumulative examinations just like the online version; and the course content was divided conveniently into ten sections for cooperative learning exercises. These activities were completed during the weekly class meetings. This activity consisted of completing a concept map on material previously studied by the student. Students were allowed to select their own groups. They were not required to maintain the same groups all semester, but they did. Students were instructed to complete their individual maps and bring them to class. During the group session, students were to compile a single map by incorporating the best aspects from their individual maps. Links were not
required in the individual maps. They were also to create links between the different concepts. The teacher monitored each group to ensure cooperation and quality interaction. Upon completion, one of the students in the group submitted the map electronically for grading. Students received an individual grade for individual map, and a group grade for the group map.

In the hybrid version of Principles of Biology II, students were required to take weekly online tests throughout the course of the semester. Information from the course was divided into five units to allow for five concept map activities to be completed as a group. The groups were selected by the students. Each group of students were given a blank concept map, and they were required to “fill in the blank” with the correct concept or note. They were also to provide links that showed the relationship between different concepts. The teacher monitored the group interactions to ensure quality work, equal participation, and cooperation among group members. Students then submitted the completed map and received a group grade for the assignment.

Participants

Participants for this research included students enrolled in History of Biology, a 400 level course taught at the university and Principles of Biology I and II, a 100 level course taught at the community college. Table 1 depicts the distribution of courses for this study. There were a total of 117 students included in this study. There were 19 online, 35 hybrid, and 53 traditional students. All students were 18 years old or older.
Table 1

*Design of Study*

<table>
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<th></th>
<th>Fall 2008</th>
<th>Spring 2009</th>
<th>Fall 2009</th>
</tr>
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<tbody>
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<td>___________</td>
<td>__________</td>
</tr>
<tr>
<td><strong>Hybrid</strong></td>
<td>__________</td>
<td>Prin Bio II</td>
<td>His of Bio</td>
</tr>
<tr>
<td><strong>Traditional</strong></td>
<td>Prin Bio I</td>
<td>Prin Bio II</td>
<td>__________</td>
</tr>
</tbody>
</table>

Note. His of Bio=History of Biology; Prin Bio I=Principles of Biology I; Prin Bio II=Principles of Biology II.

**Instrumentation**

The Students Attitudes toward Group Environments (SAGE) survey was used as the instrument of measurement for attitudes and achievement. It is located in Appendix B. This survey was developed by The Centre for the Study of Learning and Performance in Quebec, Canada and has been used to determine students’ overall attitudes toward group work and cooperative learning. I amended the original survey for the purpose of this study. The questionnaire included 53 multiple choice and three extended answer questions. Ten of the multiple choice questions focused on demographic and general information about the student. The remaining 43 multiple choice questions were based on the Likert scale. Students responded to statements based on whether they strongly disagree, disagree, are undecided, agree, or strongly agree. These questions were divided into four different subscales: (1) Quality of Product and Process, (2) Peer Support, (3) Student Interdependence, and (4) Frustration with Group Members. These subscales were defined by the authors of the survey as follows:
• Quality of Product and Process – “the perceived academic benefits of working with other students, as expressed by the quality of work produced, ease and enjoyment of material, liking to help others, and more improved learning” (Kouros & Abrami, 2006, p. 13). For this study, the product in question is the completed concept map, and the process refers to the cooperative interaction among students.

• Peer Support – “the personal support students give and receive when working in groups. The degree of student support as expressed by respecting each others’ opinions, feeling liked and involved with the group activities, and feeling valued as group members” (Kouros & Abrami, 2006, p. 13).

• Student Interdependence – “the degree to which students contribute to the group process and product, there is equal participation, and evaluation depends on the grade of other members” (Kouros & Abrami, 2006, p. 14).

• Frustration with Group Members – “the frustrations experienced when working with less academically competent members, disliking the assigned group members, and wanting to work with friends” (Kouros & Abrami, 2006, p. 14).

The reliability statistics were calculated by the authors of this instrument based on the four factors. The Cronbach’s alphas were 0.93 for Subscale 1, 0.85 for Subscale 2, 0.78 for Subscale 3, and 0.69 for Subscale 4. The overall Cronbach’s alpha for the survey was 0.93. A Cronbach’s alpha of 0.7 is generally considered acceptable. Each of the subscores and overall score exhibits a
Cronbach’s *alpha* coefficient that was close to or higher than 0.7. Therefore this instrument can be considered reliable for data collection (Kouros & Abrami, 2006, April).

The reliability statistics for the SAGE instrument were also calculated for this study. The overall Cronbach’s *alpha* for this study was 0.93. The Cronbach’s *alphas* for the individual subscales were 0.89 for Subscale 1, 0.79 for Subscale 2, 0.78 for Subscale 3, and 0.67 for Subscale 4. The reliability statistics found by the author and by myself in this study are similar. The *alpha* coefficients for the individual subscales and the overall instrument are also high confirming that the instrument used can be considered reliable for this study.

The remainder of the survey consists of three extended answer questions that reflected the same themes as the multiple choice questions. These questions allowed the students to elaborate or explain their responses to the multiple choice questions in order me to gain a greater understanding of the actual attitudes and perception toward cooperative learning for each student.

**Research Design**

The research design was descriptive and comparative. Subjects in each setting participated in the same type of cooperative learning activities. Data were collected using the SAGE instrument amended by the researcher. Descriptive data were collected and analyzed to determine the overall attitudes students have toward cooperative learning in each class setting. The surveys of each class setting were then compared to determine if a significant difference existed.
The pre-test and post-tests were also analyzed to determine achievement levels and whether or not a significant difference existed between each group.

Data Collection

Data were collected using the SAGE survey. Data for achievement score were also collected though pre-test and post-testing. The survey data and achievement data were compared; therefore, the surveys were not completely anonymous. For collecting this information, student identification numbers were used instead of names to protect the identity of the students. In all of the courses, the survey and pre-test and post-tests were administered through the Blackboard Learning System. The surveys were opened prior to completion of the last concept map and remained available for the remainder of the course. This was approximately three weeks. It was a concern that once students completed course work that they would no longer be active on Blackboard. Surveys were opened prior to completion of the maps to increase participation.

Quantitative Data Analysis

A descriptive analysis was conducted on data collected using SAGE and achievement data. Percentages were calculated to determine overall attitudes of cooperative learning and overall achievement using cooperative learning in each classroom environment: (1) traditional, (2) online, and (3) hybrid. Statistical analysis was conducted to determine if a significant difference existed between the attitudes toward cooperative learning each of the three classroom environments. The comparison was determined using Multivariate Analysis of Variance (MANOVA) with the attitudes in each of the four subscales as
dependent variables and the class design as the independent variables. Paired Sample T tests were used to analyze pre-test and post-tests to determine the level of achievement for each group. A one-way Analysis of Variance (ANOVA) was used to determine if there was a difference in achievement among the three class settings. All statistical analysis was conducted using PASW. Significance was determined using an alpha of 0.05.

Extended Answer Analysis

The survey also contained three extended answer questions. These questions allowed the students to expand on their thoughts regarding cooperative learning in each class setting. Through this questioning, students could elaborate or justify their responses for the multiple choice questioning. Questions focused on how students felt about cooperative learning, whether or not they enjoyed the activities, and if they felt that the activities helped them understand course topics. The extended answer questions were analyzed collectively and for each class setting. Different points of view for each question were reported.
CHAPTER IV
ANALYSIS OF DATA

The purpose of this study was to determine students’ attitudes and perceptions toward the use of cooperative learning as well as their academic achievement using cooperative learning in three different learning environments (1) traditional, (2) online, and (3) hybrid. The study included one independent variable: Type of Instructional Environment. Two dependent variables were evaluated. One dependent variable was the student attitudes and perceptions as measured by an established instrument. The second dependent variable was student achievement. It was measured using a pre-test and post-test. The general goal of this research was to determine if cooperative learning is an appropriate and effective method of instruction in each of these instructional environments and in what type of environment is it most conducive to learning.

Participants

The overall sample for this study consisted of 117 students. Six students were not reflected in the demographic data because they failed to complete that part of the questionnaire. Of those six students, two were from the hybrid setting, and four were from the traditional setting. This sample was over two-thirds female and Caucasian. The college level classification of this sample was fairly evenly distributed among freshman, sophomores, juniors, and seniors. Most of the students in this sample were in the 18-25 year old age range. Nearly two thirds of this sample were non-science majors. Another 30% were biology
majors, and the remaining students were majoring in a science other than biology. The descriptive data for the overall sample can be seen in Table 2.

Table 2

Overall Descriptive Data for Sample

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<td>Freshman</td>
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<td>29.7</td>
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The research requires that the overall sample be divided by instructional setting. The distribution of the participants in the traditional, hybrid, and online classes were similar to that of the overall sample in gender, ethnicity, and age. In each of these groups, the majority of the participants were Caucasian females.
between the ages of 18 and 25. A summary of the descriptive for the three instructional settings is displayed in Table 3.

Table 3

*Descriptive Data by Class Design*

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<tr>
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<td>8</td>
<td>24.2</td>
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<tr>
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<tr>
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<td>Major</td>
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<td>Biology</td>
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<tr>
<td>Other Sciences</td>
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<td>5.3</td>
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<td>12.1</td>
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<tr>
<td>Non Science</td>
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<td>94.9</td>
<td>2</td>
<td>10.5</td>
<td>12</td>
<td>36.4</td>
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</tbody>
</table>

Note: F=Frequency; P=Percentage.

Descriptive Analysis of Data

A descriptive analysis was conducted on data collected using the SAGE questionnaire. The mean and standard deviation for the overall sample were calculated for each item. Percentages of agreement, disagreement, and undecided were also calculated. Percentage of agreement was determined by
adding the percentage of strongly agree with agree. Percentage of disagreement was determined by adding the percentage of strongly disagree with disagree.

Information was divided according to the four subscales of the SAGE instrument—(1) Quality of Product and Process, (2) Peer Support, (3) Student Interdependence, and (4) Frustration with Group Members. This data appear in Appendix C. Mean, standard deviation, and percentages were also calculated for each of the class setting—traditional, online, and hybrid. These data are displayed in Appendices D, E, and F, respectively. A summary of this information is presented in the following paragraphs.

**Overall Attitudes toward Cooperative Learning**

In subscale 1, quality of product and process, the highest percentage of agreement was 85.7%. These students felt that the group activities were not a waste of time. A high percentage of students, over 75%, also felt that the material was more enjoyable when working in groups and their group members helped explain things that they did not understand. Improvement of work habits and learning more information were two more areas that over 75% agreed were associated with the cooperative learning activities. Students, however, did not feel that group worked improved their organizational skills. This was the area of highest disagreement (22.5%) in subscale 1. Students also disagreed that the assignments took less time when working with a group (21.6%) and that their work was of better quality (18.8%).

In subscale 2, peer support, six out of the eight items had higher than 90% agreement. Ninety-six percent of students agreed that they felt part of what was
going on in the group. This item had the highest agreement percentage in Subscale 2. Student also felt that they had the opportunity to express their opinions and those opinions were respected by their group members. The highest disagreement percentage (17.1%) was with the statement “I become frustrated when my group members don’t understand the material.” All others in this group had a disagreement percentage of less than five percent.

In subscale 3, student interdependence, 99.1% stated that it was important for the group to get their work done on time. No students in the sample disagreed with this statement. Ninety-seven percent of students also felt that their work was not done until everyone in the group had finished. Helping group members with what the student is good at and becoming friendly with members were two items that also had over 95% agreement rate. Students most disagreed (27%) that their grade depended on how much they all learned. Another 23% felt that they could complete the assignment without the contribution of all group members. A little over ten percent noted that they did not get to know their group members.

In subscale 4, frustration with group members, 98% of students felt they could share their ideas with the group. Over 90% also stated that they liked the students that they worked with and were not forced to work with students they did not like. Eighty-two percent also agreed that they did not waste time talking about other things during group time. The highest percentages of disagreements were associated with choosing group members and being in a group with friends.
Forty-five percent wanted to be in a group with their friends, and 32.4% wanted to self select into groups.

Attitudes toward Cooperative Learning in a Traditional Setting

In subscale 1, quality of product and process, the highest percentage of students (88.3%) did not feel that groups were a waste of time. Eighty-three percent also felt that their work habits improved when working in a group. Over 80% felt that groups made them enjoy the material more and the work did not take longer to complete when working together. Over 75% stated that the information was more interesting and their group members helped with understanding. The area of most disagreement was related to better organization when working in a group. Twenty-two percent disagreed with this statement. Eighteen percent also did not feel that their grades improved with group work or that the assignments took less time.

For subscale 2, peer support, 95% felt that they were part of the group. This was the area of highest agreement. Ninety-three percent also agreed that they could express their opinions and those opinions were respected in their group. They also reported that they were liked by their group members. The highest area of disagreement dealt with frustration when group members did not understand. This affected 8.5% of this group. A little less than 7% felt that they did not have the opportunity to express their opinions when working in their groups.

In subscale 3, student interdependence, all students felt that everyone’s ideas were needed to be successful. Over 98% became friendly with their group
members. They also felt that it was important to get the job done on time, but that job was not done until all were finished. No students disagreed with these statements. Students, however, disagreed that their grade was dependent on how much the group learned. Twenty percent also disagreed that completion of the group assignment required everyone’s contribution.

In subscale 4, frustration with group members, over 98% reported being able to share their ideas in the groups. No student disagreed with this statement. Students (96%) also agreed that they were not required to work with students they did not like. Ninety-one percent stated they like the other students in their group. Item of most disagreement dealt with selecting group members. Forty-nine percent wanted to select their own group members. Another 37% wanted to be in a group with their friends. Twenty-two percent also reported that group members sometimes failed to do their work.

**Attitudes toward Cooperative Learning in an Online Setting**

In subscale 1, quality of product and process, the highest percentage of agreement was 84%, and it was shared by 4 items. The online students felt that their work habits improved when working in a group. They also learned more and acknowledged that group members helped them with information that they did not understand. They felt that the group activities were not a waste of time. Seventy-three percent stated that they enjoyed the material more when in a group. The area of greatest disagreement (42%) was with the statement that the assignment took less time when working in a group. Thirty-one percent stated that they the work takes longer when working in a group.
In subscale 2, peer support, all the students felt that they were a part of the group. Most (94%) did not find it difficult to express their thoughts. Eighty-nine percent felt that they were liked by the group and their group did not make them feel like they were not as smart as the others. There were only two out of eight items that were disagreed upon by online students. Twenty-one percent noted feeling frustration when group members did not understand. Another 5% disagreed that they were given the opportunity to express their opinions.

In subscale 3, student interdependence, all online students agreed that it was important to get the job done on time, and they helped the other group members with what they were good at. Ninety-four percent reported that they agreed that their job was not done until everyone had finished the assignment. They also agreed that the groups allowed them to work with students who were different from themselves. The area of greatest disagreement was with getting to know the other group members. Thirty-six percent noted that they did not get to know them. Twenty-six percent also disagreed that their grade depended on what the other group members learned.

In subscale 4, frustration with group members, 94% of students agreed that they were able to share their ideas. Over 89% agreed that they liked the students that were in their group. No students disagreed with these two statements. Eighty-four percent agreed that they were not required to work with anyone they did not like. There were two items that received a higher percentage of disagreement. Fifty-two percent of students stated that some group members
 forget to do their work. They also stated that they preferred to choose the members of their groups.

**Attitudes toward Cooperative Learning in a Hybrid Setting**

In subscale 1, quality of product and process, a little over 80% agreed that the workload was usually less when working in a group. They also agreed that group work was not a waste of time. Almost 79% reported they enjoyed the material more and their group was able to help them with information they did not understand. Seventy-five percent stated they learned more and the work took less time when in groups. The greatest percentage of students (27%) disagreed with the statement that groups made the information more interesting. That same percentage disagreed that it made their work more organized. Another 18% did not feel they did better quality work or their grades improved from group work.

In subscale 2, peer support, 100% of students agreed that their group members liked them and they were given the opportunity to express their opinions. Ninety-seven percent felt the group respected their opinion and that they were a part of the group. All but 1 item in this subscale had an agreement percentage over 90%. This item dealt with frustration. Almost one third of students reported being frustrated when group members did not understand the material.

In subscale 3, student interdependence, all hybrid students felt that getting the work done on time was important. Ninety-seven percent agreed that their job was not done until all group members had finished the assignment. That same percentage reported helping group members with what they were good at and
doing their part of the work. Almost 94% became friendly with their group members and cared if they got good grades. They also got the opportunity to work with students who were different from themselves. One third of students, however, did not feel that everyone’s contribution was not necessary for the assignment to be completed. Twenty-five percent did not agree that their grade was dependent on how much others in the group learned.

In subscale 4, frustration with group members, 100% of students felt free to share their ideas in their group. Over 90% liked the students they are assigned to work with and reported not having to work with student they do not like. No students disagreed with these statements. The highest rates of disagreement were with selecting group members. Almost 70% of students preferred to select the other students in their group. Sixty percent also reported wanting to work with their friends. Almost one third also noted that some students in their groups forgot to do their work.

Statistical Analysis of Data

Statistical analysis was conducted using MANOVA to determine if a significant difference exists between the attitudes toward cooperative learning. In this analysis, the independent variable was the different class setting. The dependent variables were the four subscales of the SAGE instrument. Paired sample t tests were used to determine achievement in each of the three settings. They were used to compare the pre-test and post-test for each group. A one-way ANOVA was used to determine if there was a significant difference in achievement between the three class settings. For these statistical operations
the mean score and standard deviation for each subscale were calculated. They appear in Table 4. The data from these analyses are discussed below.

Table 4

*Mean and Standard Deviation for Subscales by Class Setting*

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<td></td>
</tr>
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Note: SD=Standard Deviation; N=Frequency; QP=Quality of Product and Process; PS=Peer Support; SI=Student Interdependence; FG=Frustation with Group Members.
Test of Attitude Hypotheses

Research Hypothesis 1: There is no statistical difference in the overall attitudes and perceptions of cooperative learning in a traditional, online, and hybrid instructional setting.

Results of the analysis indicate that there is no statistical difference in the overall attitudes and perceptions of cooperative learning between any of the class settings. The Box’s Test revealed that there was equal variances among variables (F (20, 12218.296) = 0.752, p = 0.773); therefore, Wilks’ $\Lambda$ was used as the test statistic. The results were Wilks’ $\Lambda = 0.921$, $F (8, 208) = 1.088$, $p = 0.373$. Therefore, the research hypothesis was supported.

Research Hypothesis 2: There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional setting based on quality of product and process.

Results of this analysis indicated that there was no significant difference in attitudes and perceptions for any of the groups with respect to quality of product and process. The Univariate ANOVA for this subscale as calculated by MANOVA was $F (2, 107) = 0.464$, $p = 0.630$. Therefore the research hypothesis was supported.

Research Hypothesis 3: There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional settings based on peer support.

Results of this analysis indicated that there was no significant difference in attitudes and perceptions for any of the groups with respect to peer support. The
Univariate ANOVA for this subscale as calculated by MANOVA was F (2, 107) = 0.922, p = 0.401. Therefore the research hypothesis was supported.

Research Hypothesis 4: There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional settings based on student interdependence.

Results of this analysis indicated that there was no significant difference in attitudes and perceptions for any of the groups with respect to student interdependence. The Univariate ANOVA for this subscale as calculated by MANOVA was F (2, 107) = 0.525, p = 0.593. Therefore, the research hypothesis was supported.

Research Hypothesis 5: There is no statistical difference in attitudes and perception of cooperative learning in a traditional, online, and hybrid instructional settings based on frustration with group members.

Results of this analysis indicated that there was no significant difference in attitudes and perceptions for any of the groups with respect to frustration with group members. The Univariate ANOVA for this subscale as calculated by MANOVA was F (2, 107) = 2.667, p = 0.074. Therefore the research hypothesis was supported.
Test of Achievement Hypotheses

The following analyses evaluate the research hypotheses related to achievement in the three instructional settings. A mixed model ANOVA could not be used because the achievement instruments were different for each different course. Therefore, each setting was analyzed using a paired sample t test. Figure 2 illustrates the mean scores from the pre-test and post-tests for each class design. The descriptive data for the following analyses can be found in Appendix H.

*Figure 2.* Mean scores for pre-test and post-test by design. Pre-test scores are indicated by the white bars, and post-test scores are indicated by the black and white striped bars.
Research Hypothesis 6: There is a statistical difference in pre-test and post-test scores for the traditional class setting.

Results from a paired sample t test indicate that there was a significant difference in the pre-test and post-tests administered in the traditional class setting. The mean for the pre-test was 2.05. The post-test mean was 3.36. From the statistical analysis, t (20) = -5.090, p <0.001. This evidence supports the hypothesis that there was a significant difference in scores from the pre-test to post-test for the traditional setting.

Research Hypothesis 7: There is a statistical difference in pre-test and post-test scores for the online class setting.

Results from the paired sample t test conducted in the online class setting show that there was no significant difference in achievement between the pre-test and post-testing. The mean for the pre-test was 3.05; the mean for the post-test was 3.67. From the statistical analysis, t (18) = -2.060, p = 0.055. This evidence does not support the hypothesis that there was a significant in achievement from pre-test to post-test for the online setting.

Research Hypothesis 8: There is a statistical difference in pre-test and post-test scores for the hybrid class setting.

Analysis conducted using the paired sample t test indicated that there was a significant difference in achievement between the pre-testing and post-testing in the hybrid setting. The mean score for the pre-test in the hybrid setting was 1.55; the mean post-test score was 3.33. From the statistical analysis, t (29) =
- 8.220, p < 0.001. Therefore, the evidence supports the hypothesis that a difference existed between the 2 scores in the hybrid setting.

*Research Hypothesis 9: There is no statistical difference in achievement level of students using cooperative learning in a traditional, online, and hybrid instructional settings.*

Analysis using a one-way ANOVA indicated that a statistically significant difference did exist between the three instructional settings. The mean gain scores for the settings were 1.5 for the traditional group, 0.72 for the online group, and 1.8 for the hybrid group. From the analysis, $F(2, 64) = 3.958$, $p = 0.024$. Therefore, the hypothesis was not supported by the data. Further analysis from Tukey’s Post Hoc test indicated that there was a significant difference between the online and hybrid settings with the hybrid group showing greater gains. There were no significant differences between the traditional and online setting nor the traditional and hybrid setting.

**Analysis of Extended Answer Questions**

In addition to the quantitative data, students were asked to complete three extended answer questions. Each question was analyzed and the overall opinions from the qualitative data were reported for the sample as a whole and for each classroom environment.

*Question 1 - How do you feel about the use of cooperative learning in this class?*

Overall, 110 out of 117 subjects answered this question. It was completed by all of the online students (19 subjects), 33 hybrid students, and 57 traditional...
students. For this question, positive responses were based around one or more of 4 central topics:

1. Students enjoyed cooperative learning.
2. Students felt cooperative learning activities were well-designed.
3. Students felt cooperative learning was a necessary part of the course.
4. Students felt cooperative learning was beneficial for the following reasons:
   a. Helpful in managing course work.
   b. Promoted interaction among students.
   c. Allowed students to learning for one another.
   d. Helped students gain a better understanding of information.
   e. Pushed students to work harder.

Only three students out of the sample indicated a negative attitude. These students felt that cooperative learning was a waste of time. No justification for this response was provided.

The overall view of cooperative learning in the online course was overwhelmingly positive with 18 out of 19 students providing positive feedback. Five students stated that the cooperative learning activities were helpful in managing course work. Another two students stated that it promoted interaction. Eleven students felt that cooperative learning was beneficial for one of the reasons listed above, and only one student provided negative feedback – cooperative learning was a waste of time. One student did acknowledge that
cooperative learning was challenging without face-to-face interaction, but it was still enjoyable. Another student acknowledged that the cooperative learning tasks also promoted interaction among students. This is especially important in an atmosphere that is often times isolating.

In the traditional class setting, students also had primarily positive responses. Of the 48 students who responded to question 51, two students had negative responses, three had neutral responses, and the remaining 43 students had positive responses. Twenty-five students specifically stated that they enjoyed the cooperative learning activities. Some of these activities were called “fun,” “interesting,” and “great method for learning.” Another 18 students stated that the activities were beneficial in one of the ways stated above. Six students felt that cooperative learning was absolutely necessary for success in the course. Two others noted that it promoted much needed interaction among peers. The two negative responses both noted that cooperative learning was a waste of time, and the three neutral responses stated that the activities were simply “okay.”

In the hybrid course, there were no negative responses. Of the 33 responses to this question, 30 were positive and three were neutral. The responses stating that it was “okay,” and they “did not mind doing it.” Nineteen of the students with positive statements enjoyed the cooperative learning activities. Seven students felt that it was beneficial to learning. Two noted that the course was well designed, and one felt that it was a necessary component of the course.

Overall, the majority of students enjoyed the use of cooperative learning in the course regardless of the design.
Question 2 - Did you enjoy the use of group work and cooperative learning in this class? Why or why not?

Overall, 109 students out of 117 answered this question. This included all of the online students (19 students), 58 traditional students, and 32 hybrid students. Only four students stated that they did not enjoy the cooperative learning activities in the classes. Three students had a neutral opinion and the remaining 103 students stated that they enjoyed the cooperative learning activities in each class. Of the four students who answered that they did not enjoy the activities two provided a reason:

1. Activities were boring because the same assignments were repeated throughout the course.

2. Don’t like group work.

Students provided a variety of answers as to why they enjoyed the activities. They were based around 5 reasons:

1. They were in a well-functioning group.

2. Group activities enabled them to gain a better understanding of the material.

3. Group activities allowed student-to-student interaction.

4. Group activities made the class more interesting.

5. Cooperative learning activities made course workload more manageable and time efficient.

In the online course, all of the students (19) responded to the question. Fourteen students responded positively stated that they enjoyed the cooperative
learning activities. Three stated that they did not enjoy the activities, and two were neutral. One of the neutral students noted that even though she/he did not always enjoy the activities, they were helpful in understanding the material. One other student stated that it was good in that it gave a “personal touch to distance learning.”

In the hybrid class, 32 out of 35 students responded to this question. One student had a neutral response. She/he stated that the groups were somewhat enjoyable but her/his preference was to work alone. The remaining students said that they did enjoy the cooperative learning activities. Reasons as to why it was enjoyable followed the same topics listed above. In addition, one student stated that the activities minimized the stress level in the classroom. Another stated that it allowed different viewpoints to be heard.

In the traditional class, 58 out of 63 students responded to this question. All but one student in this setting stated that they enjoyed the cooperative learning activities. That one student did not provide a reason as to why she/he did not enjoy the activities. One other student stated that the activities were enjoyable but also noted that they could be frustrating. Nearly half (25/58) stated that it was enjoyable because it enabled students to gain a better understanding of the material. Another 13 students felt it enjoyable because it allowed interaction among peers. One also noted that it promoted interaction among members of different races. The remaining students sited one of the topics previously discussed. In addition, one student stated enjoyment based on the fact that the cooperative learning provided a “hands on” approach to learning the material.
Question 3 - Do you think the use of group work and cooperative learning helped you understand difficult concepts introduced in this class? Why or why not?

Overall, 108 students out of 117 answered this question. This included all of the online students (19 students), 57 traditional students, and 32 hybrid students. Eight students responded no; and six students were neutral. The remaining 94 students stated that they thought cooperative learning helped them understand difficult concepts introduced in class. When asked why they thought it was helpful, answers stated the following reasons:

1. Information is easier to understand from peers.
2. Group members explained or clarified difficult concepts.
3. Allowed discussion of different viewpoints.
4. Group members had to work harder.

Of the 19 students in the online course, 17 students (89%) felt that the activities did aid with understanding of difficult topics; while only two students (11%) felt that it did not. One of the two “no” students stated that the lack of “face-to-face interaction with the group” prevented a deeper understanding of the material. The responses of the “yes” students were divided among reasons previously stated. The largest group of these students stated that the group helped explain difficult concepts. Three students stated that they felt that peer tutoring was what enabled them to grasp difficult concepts. One student in this group noted that she/he felt more comfortable talking with peers. The remaining
four students were evenly divided between the last two stated reasons – discussion of different viewpoints and forced students to work harder.

In the hybrid courses, 29 out of 35 (83%) students felt that the cooperative learning activities aided in the understanding of difficult topics. Two students stated that it did not help them with understanding. One reason given was that the student liked to teach her/himself. Four students had neutral opinions on the topic. The majority (15/29) of students who answered “yes” thought that the group explained or clarified concepts. Others stated that the activities required them to work harder, allowed them to see different viewpoints, or provided a comfortable situation for peer discussion. One other student noted that the use of cooperative learning activities provided an opportunity for the teacher to engage in small group discussions with the students.

In the traditional class setting, 57 out of 63 students responded to this question. Of those 57 students, four answered “no,” 51 answered “yes,” and two were neutral. Two of the “no” students provided reasons for their answer – “I had to explain to others who did not pay attention” and “I did not get everybody’s view on each assignment.” The main response provided by the “yes” group was the same as in the online and hybrid settings. Twenty-eight students agreed that group provided clarity and explanations for difficult concepts. Seven students thought peer tutoring was what enhanced understanding. Another group of seven students felt the discussion of varying viewpoints was important.
Summary

Overall, students seemed to have primarily positive opinions with respect to cooperative learning activities. This was true for all instructional settings. Results for attitude hypotheses indicated that there was no significant difference in the attitudes toward the group activities in the traditional, online, or hybrid setting. Results for the achievement hypotheses indicated a statistical difference in achievement for hybrid and traditional settings but not for the online setting. A statistical difference was also identified between the hybrid and online setting for achievement.
CHAPTER V
DISCUSSION

Cooperative learning has been documented to be an effective instructional method. It has been utilized repeatedly in the traditional classroom. In this environment, it is associated with increased academic achievement, deeper understanding of material, and improved social skills. For this method to be successful, Johnson, Johnson, and Holubec (1992, 1994) and Johnson, Johnson, and Smith (1991) acknowledge five factors that much be present: student interdependence, individual accountability, interpersonal skills, group processing, and face-to-face interaction.

In today’s changing economy, institutions are seeing an increase in their nontraditional student populations. Many of these students have returned to school to further their education or begin a new career all together. They not only bring with them books to the instructional setting but families, jobs, and other responsibilities. With these other factors to consider, many of these nontraditional students are unable to attend regularly scheduled class meetings. Instead they look for more flexible options such as online or hybrid courses.

To meet the needs of this growing population, it is imperative that these nontraditional class settings be designed in such a way to maximize student learning. This includes utilizing the known advantages associated with cooperative learning. According to researchers (Johnson, Johnson, & Holubec 1992, 1994; Johnson, Johnson, & Smith, 1991) face-to-face interaction is a
necessary component of this instructional method. So, can cooperative learning work online?

I designed a research project to answer that question. The purpose of this study was to determine the attitudes toward the use of cooperative learning as well as academic achievement using cooperative learning in traditional, online, and hybrid instructional settings. I also sought to determine whether or not any differences existed between the three instructional settings. Below is a summary of the research conducted as well as a discussion of the findings.

Summary of Procedure

In this project, I designed cooperative learning activities to be completed in each instructional setting. Students were to participate in these activities four to five times throughout the semester. In each activity, students were to work together to complete a concept map that illustrated the important topics from each course unit. Due the nature of the research, the cooperative learning activities were not identical for each class setting. Difference in student levels (freshman versus seniors), courses, and length of interaction time mandated that the activities vary slightly. To maintain the integrity of this research, I worked very hard to ensure that the activities were as close as possible and the quality of each cooperative learning session was equal.

Attitudes toward cooperative learning were measured using the Student Attitudes toward Group Environments (SAGE) questionnaire. This instrument was originally administered to high school and junior college students and yielded acceptable reliability scores. In this research, the instrument was used on
junior college as well as university students. The reliability statistics calculated from this research were very similar to the statistics originally published by the authors of the instrument. This provides further evidence that the SAGE questionnaire is a valid instrument for assessing attitudes toward cooperative learning.

Participants in this study were also asked to complete a pre and post-test. These tests contained content-based questions. The change in scores from pre-test to post-test was used to assess differences in academic achievement between the three class settings. This research was conducted in different courses with different content; therefore, the pre-test and posts test could not be identical for each instructional group. The tests were, however, kept the same within each course.

Summary of Findings

Descriptive analysis of responses to the SAGE questionnaire indicated that most students regardless of instructional setting reported positive attitudes toward the cooperative learning activities in their respective classes. Students felt that the material was more interesting and easier to understand when working in groups. Most students felt that their opinions were respected by the other group members and reported feeling “part of the group.” Nearly all negative remarks were related to the selection of other group members. Most students wanted to self-select into a group or be in a group with their friends.

The statistical analysis reflected the same conclusions as the descriptive data. It reaffirmed the hypotheses that stated that there was no significant
difference in attitudes between the three class settings. This was true for the overall SAGE instrument as well as all four subscales.

The research also addressed the question of increased academic achievement in association with cooperative learning. For the traditional and hybrid setting, there was a significant difference between pre-test and post-test evaluations. There was not a significant change in pre-test and post-test scores for the online course. In comparison of the three settings and their gain between the pre and post examinations, the data analysis indicated that there was no difference in the hybrid and traditional setting or the online and traditional settings. However, a difference was detected in achievement between the hybrid and online settings with the hybrid setting showing a higher gain score.

Discussion of Findings

Attitude Findings

The attitudes toward cooperative learning as measured by this survey were overwhelmingly positive. This was true for the overall sample and for each individual class setting. Students indicated an agreement of 75% or greater for the majority of the statements in the survey. As indicated from the extended answer responses, students enjoyed the activities. When students like their classes, they are more attentive and willing to participate. John Dewey stated that students’ likes and dislikes are just as important as the lesson itself (Henson, 2003). Students also noted that the cooperative learning activities were a necessary part of the course. When individuals are facing a difficult task, sometimes it is helpful to know that you are not “in it alone.” By working in
groups, students knew that they would have the support of the group to help them accomplish the assignment set for them. The collaboration among members makes the task at hand less daunting than it would be if attempted alone.

Course design may have also been a factor contributing to the overall positive attitudes toward cooperative learning. It is not as simple as putting students into groups and telling them to cooperate. In the classroom, activities that have not been properly planned can lead to negative experiences for students. In developing the cooperative learning exercises for this research project, great care was taken to ensure this was a quality experience. The design for the online course was especially challenging because there was no existing model for this type of environment. The preliminary plans were tested and retested during semesters preceding this study to create a model that required cooperation among students who were never in physical contact with one another. This model had to include plans for every “what if” situation that might arise during the activity. Nonetheless, the model for cooperative learning used in this research project was successful. Each activity was completed as planned, and the students were provided with a good cooperative learning experience as evidence from their feedback.

The traditional and hybrid experiences were much less difficult to construct after designing the online activities. Several models were available to provide guidance on the development of these activities. By making a few small changes from the online design, the activities were set up for the other two class
settings. They too were successfully executed in their respective classrooms. The effectiveness of each course design could have contributed to the overall positive attitudes reported by the majority of students. Student responses from the extended answer questions support this statement. One student in the online course specifically stated that the class was designed well. Others alluded to the design by making comments such as “the course ran smoothly.”

When considering attitudes, it is important to note that there was no difference in the attitudes between the three settings. This is especially important in the online class. This study sought to determine if cooperative learning could work without face-to-face interaction. The attitudes in the online class were not statistically different from the traditional and hybrid courses where face-to-face interaction was present. This suggests that cooperative learning can be accomplished without this essential element. It also suggests that cooperative learning can be equally successful whether it is online or in other instructional settings.

Students also stated that cooperative learning promoted student interaction within each course. This interaction is often missing in the online setting. Students typically complete their assignments with little communication between one another. By enhancing the online experience with cooperative learning, instructors have the opportunity to create a totally different instructional atmosphere, one that is perhaps more conducive to learning.

Not all students surveyed reported positive attitudes. However, the number of students that exhibited negative attitudes was minimal considering the
sample size. When asked how they felt about cooperative learning, less than 3% responded negatively. These students may have been involved in a previous cooperative learning exercise that was unsuccessful. It is also important to note that some students simply prefer to work alone. Regardless of these reasons, whether it be the student’s introverted personality, a sense of inferiority, or a sense of independence, any of these could lead to negative feelings about cooperative learning. High achieving students may not see the benefit of working in a group. If they already have a deep understanding of the material, then they may not feel they gain anything from participation. They may feel that it is not worth the time investment and feel frustrated when trying to explain difficult concepts to other members of their group.

In education and any other area, one cannot expect to please everyone. There are always going to be some students who are not completely satisfied. Often times it is the highest achieving student. In the reality of the classroom, if teachers are to educate the majority of their students, they cannot teach at the highest level nor the lowest level but somewhere in between. With cooperative learning, educators have the opportunity to reach a variety of instructional levels with only a very small percentage of students who are dissatisfied.

**Achievement Findings**

In all three instructional settings, students’ scores increased from pre-test to post-test. For the hybrid and traditional groups, this difference was significant. An increase in achievement associated with cooperative learning activities has been well documented by researchers such as Johnson, Johnson, and Stanne
Students in all three settings reported that cooperative learning helped them gain a better understanding of the information. Any method that can increase achievement, regardless of whether the increase is significant, can be utilized as a useful instructional technique.

In an overall comparison of achievement for the three groups, data indicated that there was a significant difference in the online and hybrid courses. Students in the hybrid course showed greater gain scores than those in the online course. There was no significant difference between the gain scores of traditional and online students or between traditional and hybrid students. A one-way ANOVA was used to analyze the data with respect to difference between groups. A mixed model ANOVA was the preferred method for this analysis, but it could not be utilized because the achievement measures were different. Different achievement measures were used because the data were collected from different courses. Therefore, there was no direct way to compare achievement in the three instructional settings.

The scope of the analysis for achievement was also very small. Pre-test and post-test consisted of only five content questions. These questions may not have provided an adequate evaluation of the achievement in the three settings. Also with only five questions, gain scores were very limited.

Overall, the achievement findings indicated that in the online setting, there was not a significant difference in scores when using cooperative learning. It also indicated that the gain scores were smaller for the online course when compared to the hybrid course. There are a couple possible explanations for this
occurrence. First of all, the instrument used to measure these two settings may not have provided an accurate measure of achievement. The scope of the research has already been noted as a possible hindrance to the analysis.

Secondly, the data indicated that at the end of the study the online students were achieving at the same level as the students in the other settings. Their gain scores may have been lower because their pre-test scores were higher. If these students were already higher academically, then they may not show as much increase in scores as those that were academically lower.

Limitations

At the beginning of this study the following limitations were identified:

(1) Students in the research were limited to those enrolled in courses taught by two instructors, one instructing at a community college and one instructing at a university, both located in south Mississippi. (2) Instruction occurring online or in the hybrid format was limited by the applications available through the Learning Management System, Blackboard. (3) Instruction in hybrid classes was of new design. Due to the novelty of hybrid courses at the two institutions involved in the research, the collection of data occurred in classes that were being taught for the very first time. Both instructors, however, had experience in online and traditional instruction. In regard to the last limitation, even though the hybrid courses were of new design, they were successfully executed. The activities were completed just as they were designed; therefore, this should cause no negative effect on the research. In addition to the above limitation, it should also be noted that due to the nature of the research, it was not possible for all of the achievement
measures to be identical. The students were in different courses and were measured using different content. Therefore, there was no direct way to compare the achievement of all three settings. It was also not possible to administer a pre-survey measurement to all subjects. Thus, it is possible that the groups may not have been exactly the same initially.

Recommendations

*Recommendations for Practice*

This research was designed to determine whether or not cooperative learning could be effective in nontraditional environments. The data from this study indicate that it can be effective in traditional and nontraditional environments. This is extremely important in an educational environment that is seeing an increase in enrollment in nontraditional courses. As institutions begin to offer more and more courses online or with a reduced number of face to face hours, it is important that they provide the same quality of instruction for the students in those classes. Over the last few decades, researchers have documented the benefits of cooperative learning. It is used in traditional courses successfully to increase achievement, as well as, many other aspects of learning. If equality between traditional and nontraditional instruction is to be maintained, educators must begin providing cooperative learning exercises for their nontraditional courses as well. This task, however, is more easily said than done.

Many hours were put into designing a working model for online cooperative learning in preparation of this research. Instructors will require time and administrative support for implementation of cooperative learning in
nontraditional courses. Each course design will be different, and instructors will need the opportunity to plan and prepare for each exercise. Without proper preparation, cooperative learning may not provide the quality experience that was achieved with this project. Administrative support is essential for this to work. In its absence, many instructors may feel that it is not cost efficient to develop these activities, and students miss out on the advantages associated with this type of learning.

In addition to the improved experience, cooperative learning online and in hybrid courses has the potential to improve attendance and reduce attrition rates (Johnson, Johnson, & Stanne, 2000). The majority of the students in this study regardless of class reported enjoying the course. When students enjoy their courses, they may be more motivated to stay in class. Studies have indicated that cooperative learning can improve attendance. By incorporating cooperative learning, it is possible to keep students enrolled in the nontraditional courses.

Recommendations for Future Research

The idea of nontraditional learning is still a relatively novel one in many educational settings. There is still much research to be done to further evaluate its effectiveness. Future research could be expanded to include a much larger sample size. This sample was also limited to students who were enrolled in science courses. Group work is not new to science; students are accustomed to working in groups in the laboratory. Research must extend to the other subject areas as well to assess the effectiveness of cooperative learning in the different instructional settings.
This research indicated that all three settings exhibited positive attitudes toward cooperative learning. It also showed that there was an increase in achievement between pre-test and post-testing after participating in the cooperative learning exercises. It did not, however, show whether positive attitudes in the classroom leads to higher achievement scores. Many students reported deeper understanding of material or improvement of work habits, but does this translate in to greater achievement. More research is needed in this area to determine if students’ perceptions of learning and positive attitudes correlate with actual higher achievement scores.

Summary

Cooperative learning is a method of active learning that when executed successfully can provided students with an opportunity to improve attitudes and achievement in the traditional classroom. In education today, many courses are being taught in a nontraditional classroom. So, do the advantages listed above also apply to the nontraditional classroom? That is the problem addressed by this research project. The analysis concluded that cooperative learning can be just as successful in the nontraditional classroom as the traditional one if implemented properly.
APPENDIX A

HUMAN SUBJECTS DOCUMENTATION

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Institutional Review Board
118 College Drive #5147
Hattiesburg, MS 39406-0001
Tel: 601.266.6820
Fax: 601.266.5509
www.usm.edu/irb

HUMAN SUBJECTS PROTECTION REVIEW COMMITTEE
NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Human Subjects Protection Review Committee in accordance with Federal Drug Administration regulations (21 CFR 21, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the “Adverse Effect Report Form”.
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 2811303
PROJECT TITLE: Cooperative Learning: Attitudes, Perceptions, and Achievement in a Traditional, Online, and Hybrid Class Setting
PROPOSED PROJECT DATES: 08/01/08 to 08/01/2010
PROJECT TYPE: Dissertation or Thesis
PRINCIPAL INVESTIGATORS: Allison Duckworth
COLLEGE/DIVISION: College of Science & Technology
DEPARTMENT: Science Education
FUNDING AGENCY: N/A
HSPRC COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 11/24/08 to 11/23/09

[Signature]
Lawrence A. Hosman, Ph.D.
HSPRC Chair

[Date] 12-01-08

Hello Allison,

I am a science education graduate student at the University of Southern Mississippi and am conducting research on students' attitudes toward cooperative learning. My dissertation will compare attitudes in an online class, a traditional face-to-face class, and a hybrid class. I would like to use the Student Attitudes toward Group Environments (SAGE) survey as the instrument for my research. Is there any literature or research on this survey's validity? If so, could you please let me know where or if I can access it. Thank you so much for allowing me to use this instrument.

I think it is great that you provide instruments for instructors to use in their research.

Glad to hear you are able to use the SAGE. Please refer to the publication that has been posted just below the instrument on the site for further information. That is the best we can do.

Bye for now,
Anne

Anne Wade
Manager/Information Specialist
Centre for the Study of Learning and Performance

Tel: 514-848-2424 x2885
Fax: 514-848-4520
Email: wada@education.concordia.ca
Web: http://cslp.concordia.ca/
### Descriptive Data from SAGE for the Overall Sample

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<td>The material is more interesting to me when I work with other students.</td>
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<td>1.088</td>
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<tr>
<td>2</td>
<td>I enjoy the material more when I work with other students.</td>
<td>3.81</td>
<td>112</td>
<td>1.070</td>
</tr>
<tr>
<td>3</td>
<td>My group members do not care about my feelings. <em>(My group members care about my feelings.)</em></td>
<td>4.21</td>
<td>112</td>
<td>.810</td>
</tr>
<tr>
<td>4</td>
<td>When I work in a group, my work habits improve.</td>
<td>3.91</td>
<td>112</td>
<td>.954</td>
</tr>
<tr>
<td>5</td>
<td>When I work in a group, I do better quality work.</td>
<td>3.71</td>
<td>112</td>
<td>1.144</td>
</tr>
<tr>
<td>6</td>
<td>The work load is usually less when I work with other students.</td>
<td>3.73</td>
<td>112</td>
<td>1.115</td>
</tr>
<tr>
<td>7</td>
<td>I let the other students do most of the work. <em>(I do not let the other students do most of the work.)</em></td>
<td>4.40</td>
<td>112</td>
<td>.664</td>
</tr>
<tr>
<td>8</td>
<td>I feel working in groups is a waste of time. <em>(I do not feel working in groups is a waste of time.)</em></td>
<td>4.24</td>
<td>112</td>
<td>.883</td>
</tr>
<tr>
<td>9</td>
<td>My grades improve when I work with other students.</td>
<td>3.51</td>
<td>112</td>
<td>.995</td>
</tr>
<tr>
<td>10</td>
<td>The work takes longer to complete when I work with other students. <em>(The work does not take longer to complete when I work with other students.)</em></td>
<td>3.81</td>
<td>111</td>
<td>.977</td>
</tr>
<tr>
<td>11</td>
<td>The material is easier to understand when I work with other students.</td>
<td>3.69</td>
<td>111</td>
<td>1.016</td>
</tr>
<tr>
<td>12</td>
<td>It takes less time to complete the assignment when I work with others.</td>
<td>3.70</td>
<td>111</td>
<td>1.149</td>
</tr>
<tr>
<td>13</td>
<td>My group's members help explain things that I do not understand.</td>
<td>3.87</td>
<td>111</td>
<td>.916</td>
</tr>
<tr>
<td>14</td>
<td>I learn more information when I work with other students.</td>
<td>3.80</td>
<td>111</td>
<td>.893</td>
</tr>
</tbody>
</table>
Table C1 (continued).

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Mean</th>
<th>N</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>I become frustrated when my group members do not understand the material. * (I do not become frustrated when my group members do not understand the material.)</td>
<td>3.75</td>
<td>111</td>
<td>.995</td>
</tr>
<tr>
<td>16</td>
<td>My work is better organized when I work in a group.</td>
<td>3.39</td>
<td>111</td>
<td>1.020</td>
</tr>
<tr>
<td>17</td>
<td>I do not care if group members get good grades. * (I care if group members get good grades.)</td>
<td>4.21</td>
<td>111</td>
<td>.854</td>
</tr>
<tr>
<td>18</td>
<td>When I work in groups I want to be with my friends. * (When I work in groups I do not want to be with my friends.)</td>
<td>2.82</td>
<td>111</td>
<td>1.161</td>
</tr>
<tr>
<td>19</td>
<td>My group members do not respect my opinion. * (My group members respect my opinion.)</td>
<td>4.30</td>
<td>111</td>
<td>.655</td>
</tr>
<tr>
<td>20</td>
<td>My group members make me feel that I am not as smart as they are. * (My group members do not make me feel that I am not as smart as they are.)</td>
<td>4.23</td>
<td>111</td>
<td>.747</td>
</tr>
<tr>
<td>21</td>
<td>I become friendly with my group members.</td>
<td>4.24</td>
<td>111</td>
<td>.559</td>
</tr>
<tr>
<td>22</td>
<td>When I work in a group, I am able to share my ideas.</td>
<td>4.23</td>
<td>111</td>
<td>.466</td>
</tr>
<tr>
<td>23</td>
<td>I find it hard to express my thoughts when I work in a group. * (I do not find it hard to express my thoughts when I work in a group.)</td>
<td>4.20</td>
<td>111</td>
<td>.644</td>
</tr>
<tr>
<td>24</td>
<td>My group members like to help me learn the material.</td>
<td>3.77</td>
<td>111</td>
<td>.863</td>
</tr>
<tr>
<td>25</td>
<td>I feel I am part of what is going on in the group.</td>
<td>4.26</td>
<td>111</td>
<td>.583</td>
</tr>
<tr>
<td>26</td>
<td>Our job is not done until everyone has finished the assignment.</td>
<td>4.37</td>
<td>111</td>
<td>.571</td>
</tr>
<tr>
<td>27</td>
<td>My grade depends on how much we all learn.</td>
<td>3.24</td>
<td>111</td>
<td>1.055</td>
</tr>
<tr>
<td>28</td>
<td>I learn to work with students who are different from me.</td>
<td>4.21</td>
<td>110</td>
<td>.607</td>
</tr>
<tr>
<td>29</td>
<td>I do not like the students I am assigned to work with. * (I like the students I am assigned to work with.)</td>
<td>4.35</td>
<td>111</td>
<td>.683</td>
</tr>
<tr>
<td>30</td>
<td>I get to know my group members well.</td>
<td>3.80</td>
<td>111</td>
<td>.893</td>
</tr>
</tbody>
</table>
Table C1 (continued).

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Mean</th>
<th>N</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>When I work in a group, I get the grade I deserve.</td>
<td>3.85</td>
<td>111</td>
<td>.876</td>
</tr>
<tr>
<td>32</td>
<td>When I work in a group, there are opportunities to express my opinions.</td>
<td>4.20</td>
<td>111</td>
<td>.711</td>
</tr>
<tr>
<td>33</td>
<td>We can not complete the assignment unless everyone contributes,</td>
<td>3.62</td>
<td>111</td>
<td>1.152</td>
</tr>
<tr>
<td>34</td>
<td>My group members do not like me. <em>(My group members like me.)</em></td>
<td>4.30</td>
<td>111</td>
<td>.641</td>
</tr>
<tr>
<td>35</td>
<td>I help my group members with what I am good at.</td>
<td>4.26</td>
<td>111</td>
<td>.670</td>
</tr>
<tr>
<td>36</td>
<td>I have to work with other students who are not as smart as I am. <em>(I have to work with other students who are as smart as I am.)</em></td>
<td>3.65</td>
<td>111</td>
<td>1.024</td>
</tr>
<tr>
<td>37</td>
<td>Some group members forget to do the work. <em>(Group members remember to do the work.)</em></td>
<td>3.27</td>
<td>111</td>
<td>1.144</td>
</tr>
<tr>
<td>38</td>
<td>It is important to me that my group gets the work done on time.</td>
<td>4.49</td>
<td>111</td>
<td>.520</td>
</tr>
<tr>
<td>39</td>
<td>I am forced to work with students I do not like. <em>(I am not forced to work with students I do not like.)</em></td>
<td>4.31</td>
<td>111</td>
<td>.658</td>
</tr>
<tr>
<td>40</td>
<td>When I work with other students we spend too much time talking about other things. <em>(When I work with other students we do not spend too much time talking about other things.)</em></td>
<td>4.03</td>
<td>111</td>
<td>.868</td>
</tr>
<tr>
<td>41</td>
<td>I also learn when I teach the material to my group members.</td>
<td>4.00</td>
<td>111</td>
<td>.763</td>
</tr>
<tr>
<td>42</td>
<td>Everyone's ideas are needed if we are going to be successful.</td>
<td>4.30</td>
<td>111</td>
<td>.793</td>
</tr>
<tr>
<td>43</td>
<td>I prefer to choose the students I work with. <em>(I do not prefer to choose the students I work with.)</em></td>
<td>2.61</td>
<td>111</td>
<td>1.215</td>
</tr>
</tbody>
</table>

Note: N= Frequency; SD = Standard Deviation. * Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table C2

Subscale 1 - Quality of Product and Process for the Overall Sample

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>A+SA</th>
<th>U</th>
<th>D+SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The material is more interesting to me when I work with other students.</td>
<td>72.3</td>
<td>10.7</td>
<td>17.0</td>
</tr>
<tr>
<td>2</td>
<td>I enjoy the material more when I work with other students.</td>
<td>78.6</td>
<td>6.3</td>
<td>15.2</td>
</tr>
<tr>
<td>4</td>
<td>When I work in a group, my work habits improve.</td>
<td>76.8</td>
<td>12.5</td>
<td>10.7</td>
</tr>
<tr>
<td>5</td>
<td>When I work in a group, I do better quality work.</td>
<td>64.3</td>
<td>17.0</td>
<td>18.8</td>
</tr>
<tr>
<td>6</td>
<td>The work load is usually less when I work with other students.</td>
<td>70.5</td>
<td>11.6</td>
<td>17.9</td>
</tr>
<tr>
<td>8</td>
<td>I feel working in groups is a waste of time. <em>(I do not feel working in groups is a waste of time.)</em></td>
<td>85.7</td>
<td>10.7</td>
<td>3.6</td>
</tr>
<tr>
<td>9</td>
<td>My grades improve when I work with other students.</td>
<td>52.7</td>
<td>29.5</td>
<td>17.9</td>
</tr>
<tr>
<td>10</td>
<td>The work takes longer to complete when I work with other students.</td>
<td>74.8</td>
<td>12.6</td>
<td>12.6</td>
</tr>
<tr>
<td>11</td>
<td>The material is easier to understand when I work with other students.</td>
<td>66.7</td>
<td>19.8</td>
<td>13.5</td>
</tr>
<tr>
<td>12</td>
<td>It takes less time to complete the assignment when I work with others.</td>
<td>64.4</td>
<td>9.0</td>
<td>21.6</td>
</tr>
<tr>
<td>13</td>
<td>My group's members help explain things that I do not understand.</td>
<td>78.4</td>
<td>10.8</td>
<td>10.8</td>
</tr>
<tr>
<td>14</td>
<td>I learn more information when I work with other students.</td>
<td>75.7</td>
<td>13.5</td>
<td>10.8</td>
</tr>
<tr>
<td>16</td>
<td>My work is better organized when I work in a group.</td>
<td>52.3</td>
<td>25.2</td>
<td>22.5</td>
</tr>
<tr>
<td>24</td>
<td>My group members like to help me learn the material.</td>
<td>68.5</td>
<td>21.6</td>
<td>9.9</td>
</tr>
<tr>
<td>31</td>
<td>When I work in a group, I get the grade I deserve.</td>
<td>73.9</td>
<td>17.1</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.
*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table C3

Subscale 2 - Peer Support for the Overall Sample

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>A+SA</th>
<th>U</th>
<th>D+SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>My group members do not care about my feelings. <em>(My group members care about my feelings.)</em></td>
<td>83.9</td>
<td>13.4</td>
<td>2.7</td>
</tr>
<tr>
<td>15</td>
<td>I become frustrated when my group members do not understand the material. <em>(I do not become frustrated when my group members do not understand the material.)</em></td>
<td>74.8</td>
<td>8.1</td>
<td>17.1</td>
</tr>
<tr>
<td>19</td>
<td>My group members do not respect my opinion. <em>(My group members respect my opinion.)</em></td>
<td>91.0</td>
<td>8.1</td>
<td>0.9</td>
</tr>
<tr>
<td>20</td>
<td>My group members make me feel that I am not as smart as they are. <em>(My group members do not make me feel that I am not as smart as they are.)</em></td>
<td>91.0</td>
<td>5.4</td>
<td>3.6</td>
</tr>
<tr>
<td>23</td>
<td>I find it hard to express my thoughts when I work in a group. <em>(I do not find it hard to express my thoughts when I work in a group.)</em></td>
<td>93.7</td>
<td>4.5</td>
<td>1.8</td>
</tr>
<tr>
<td>25</td>
<td>I feel I am part of what is going on in the group.</td>
<td>96.4</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>32</td>
<td>When I work in a group, there are opportunities to express my opinions.</td>
<td>91.9</td>
<td>3.6</td>
<td>4.5</td>
</tr>
<tr>
<td>34</td>
<td>My group members do not like me. <em>(My group members like me.)</em></td>
<td>94.6</td>
<td>4.5</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.

*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table C4

Subscale 3 - Student Interdependence for the Overall Sample

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>A+SA</th>
<th>U</th>
<th>D+SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>I let the other students do most of the work. <em>(I do not let the other students do most of the work.)</em></td>
<td>93.8</td>
<td>4.5</td>
<td>1.8</td>
</tr>
<tr>
<td>17</td>
<td>I do not care if group members get good grades. <em>(I care if group members get good grades.)</em></td>
<td>88.3</td>
<td>6.3</td>
<td>5.4</td>
</tr>
<tr>
<td>21</td>
<td>I become friendly with my group members.</td>
<td>95.5</td>
<td>3.6</td>
<td>0.9</td>
</tr>
<tr>
<td>26</td>
<td>Our job is not done until everyone has finished the assignment.</td>
<td>97.3</td>
<td>1.8</td>
<td>0.9</td>
</tr>
<tr>
<td>27</td>
<td>My grade depends on how much we all learn.</td>
<td>45.9</td>
<td>27.0</td>
<td>27.0</td>
</tr>
<tr>
<td>28</td>
<td>I learn to work with students who are different from me.</td>
<td>94.5</td>
<td>4.5</td>
<td>0.9</td>
</tr>
<tr>
<td>30</td>
<td>I get to know my group members well.</td>
<td>73.0</td>
<td>16.2</td>
<td>10.8</td>
</tr>
<tr>
<td>33</td>
<td>We can not complete the assignment unless everyone contributes,</td>
<td>63.1</td>
<td>13.5</td>
<td>23.4</td>
</tr>
<tr>
<td>35</td>
<td>I help my group members with what I am good at.</td>
<td>95.5</td>
<td>1.8</td>
<td>2.7</td>
</tr>
<tr>
<td>38</td>
<td>It is important to me that my group gets the work done on time.</td>
<td>99.1</td>
<td>0.9</td>
<td>0.0</td>
</tr>
<tr>
<td>41</td>
<td>I also learn when I teach the material to my group members.</td>
<td>82.9</td>
<td>12.6</td>
<td>4.5</td>
</tr>
<tr>
<td>42</td>
<td>Everyone’s ideas are needed if we are going to be successful.</td>
<td>93.7</td>
<td>1.8</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree. *Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table C5

# Subscale 4 - Frustration with Group Member for the Overall Sample

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>A+SA</th>
<th>U</th>
<th>D+SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>When I work in groups I want to be with my friends. <em>(When I work in groups I do not want to be with my friends.)</em></td>
<td>31.5</td>
<td>22.5</td>
<td>45.9</td>
</tr>
<tr>
<td>22</td>
<td>When I work in a group, I am able to share my ideas.</td>
<td>98.2</td>
<td>1.8</td>
<td>0.0</td>
</tr>
<tr>
<td>29</td>
<td>I do not like the students I am assigned to work with. <em>(I like the students I am assigned to work with.)</em></td>
<td>91.9</td>
<td>6.3</td>
<td>1.8</td>
</tr>
<tr>
<td>36</td>
<td>I have to work with other students who are not as smart as I am. <em>(I have to work with other students who are as smart as I am.)</em></td>
<td>62.2</td>
<td>21.6</td>
<td>16.2</td>
</tr>
<tr>
<td>37</td>
<td>Some group members forget to do the work. <em>(Group members remember to do the work.)</em></td>
<td>50.5</td>
<td>19.8</td>
<td>29.7</td>
</tr>
<tr>
<td>39</td>
<td>I am forced to work with students I do not like. <em>(I am not forced to work with students I do not like.)</em></td>
<td>92.8</td>
<td>5.4</td>
<td>1.8</td>
</tr>
<tr>
<td>40</td>
<td>When I work with other students we spend too much time talking about other things. <em>(When I work with other students we do not spend too much time talking about other things.)</em></td>
<td>82.0</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>43</td>
<td>I prefer to choose the students I work with. <em>(I do not prefer to choose the students I work with.)</em></td>
<td>55.9</td>
<td>11.7</td>
<td>32.4</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.
*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
APPENDIX D

DESCRIPTIVE DATA FROM SAGE FOR THE TRADITIONAL SETTING

Table D1

*Mean and Standard Deviations for the Traditional Setting*

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Mean</th>
<th>N</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The material is more interesting to me when I work with other students.</td>
<td>3.92</td>
<td>60</td>
<td>.962</td>
</tr>
<tr>
<td>2</td>
<td>I enjoy the material more when I work with other students.</td>
<td>3.78</td>
<td>60</td>
<td>1.121</td>
</tr>
<tr>
<td>3</td>
<td>My group members do not care about my feelings. <em>(My group members care about my feelings.)</em></td>
<td>4.23</td>
<td>60</td>
<td>.890</td>
</tr>
<tr>
<td>4</td>
<td>When I work in a group, my work habits improve.</td>
<td>4.00</td>
<td>60</td>
<td>.974</td>
</tr>
<tr>
<td>5</td>
<td>When I work in a group, I do better quality work.</td>
<td>3.70</td>
<td>60</td>
<td>1.124</td>
</tr>
<tr>
<td>6</td>
<td>The work load is usually less when I work with other students.</td>
<td>3.77</td>
<td>60</td>
<td>1.155</td>
</tr>
<tr>
<td>7</td>
<td>I let the other students do most of the work. <em>(I do not let the other students do most of the work.)</em></td>
<td>4.35</td>
<td>60</td>
<td>.685</td>
</tr>
<tr>
<td>8</td>
<td>I feel working in groups is a waste of time. <em>(I do not feel working in groups is a waste of time.)</em></td>
<td>4.37</td>
<td>60</td>
<td>.802</td>
</tr>
<tr>
<td>9</td>
<td>My grades improve when I work with other students.</td>
<td>3.53</td>
<td>60</td>
<td>.965</td>
</tr>
<tr>
<td>10</td>
<td>The work takes longer to complete when I work with other students. <em>(The work does not take longer to complete when I work with other students.)</em></td>
<td>4.00</td>
<td>59</td>
<td>.830</td>
</tr>
<tr>
<td>11</td>
<td>The material is easier to understand when I work with other students.</td>
<td>3.76</td>
<td>59</td>
<td>1.040</td>
</tr>
<tr>
<td>12</td>
<td>It takes less time to complete the assignment when I work with others.</td>
<td>3.69</td>
<td>59</td>
<td>1.055</td>
</tr>
<tr>
<td>13</td>
<td>My group’s members help explain things that I do not understand.</td>
<td>3.86</td>
<td>59</td>
<td>1.025</td>
</tr>
<tr>
<td>14</td>
<td>I learn more information when I work with other students.</td>
<td>3.75</td>
<td>59</td>
<td>.939</td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td>Mean</td>
<td>SD</td>
<td>Significance</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------</td>
<td>------</td>
<td>-----</td>
<td>--------------</td>
</tr>
<tr>
<td>15</td>
<td>I become frustrated when my group members do not understand the material. <em>(I do not become frustrated when my group members do not understand the material.)</em></td>
<td>4.02</td>
<td>59</td>
<td>.777</td>
</tr>
<tr>
<td>16</td>
<td>My work is better organized when I work in a group.</td>
<td>3.32</td>
<td>59</td>
<td>.973</td>
</tr>
<tr>
<td>17</td>
<td>I do not care if group members get good grades. <em><em>(I care if group members get good grades.</em>)</em></td>
<td>4.19</td>
<td>59</td>
<td>.880</td>
</tr>
<tr>
<td>18</td>
<td>When I work in groups I want to be with my friends. <em><em>(When I work in groups I do not want to be with my friends.</em>)</em></td>
<td>2.97</td>
<td>59</td>
<td>1.217</td>
</tr>
<tr>
<td>19</td>
<td>My group members do not respect my opinion. <em><em>(My group members respect my opinion.</em>)</em></td>
<td>4.31</td>
<td>59</td>
<td>.650</td>
</tr>
<tr>
<td>20</td>
<td>My group members make me feel that I am not as smart as they are. <em><em>(My group members do not make me feel that I am not as smart as they are.</em>)</em></td>
<td>4.19</td>
<td>59</td>
<td>.798</td>
</tr>
<tr>
<td>21</td>
<td>I become friendly with my group members.</td>
<td>4.34</td>
<td>59</td>
<td>.512</td>
</tr>
<tr>
<td>22</td>
<td>When I work in a group, I am able to share my ideas.</td>
<td>4.27</td>
<td>59</td>
<td>.485</td>
</tr>
<tr>
<td>23</td>
<td>I find it hard to express my thoughts when I work in a group. <em><em>(I do not find it hard to express my thoughts when I work in a group.</em>)</em></td>
<td>4.20</td>
<td>59</td>
<td>.738</td>
</tr>
<tr>
<td>24</td>
<td>My group members like to help me learn the material.</td>
<td>3.86</td>
<td>59</td>
<td>.899</td>
</tr>
<tr>
<td>25</td>
<td>I feel I am part of what is going on in the group.</td>
<td>4.22</td>
<td>59</td>
<td>.645</td>
</tr>
<tr>
<td>26</td>
<td>Our job is not done until everyone has finished the assignment.</td>
<td>4.44</td>
<td>59</td>
<td>.534</td>
</tr>
<tr>
<td>27</td>
<td>My grade depends on how much we all learn.</td>
<td>3.24</td>
<td>59</td>
<td>1.023</td>
</tr>
<tr>
<td>28</td>
<td>I learn to work with students who are different from me.</td>
<td>4.24</td>
<td>59</td>
<td>.678</td>
</tr>
<tr>
<td>29</td>
<td>I do not like the students I am assigned to work with. <em><em>(I like the students I am assigned to work with.</em>)</em></td>
<td>4.36</td>
<td>59</td>
<td>.737</td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>Mean</td>
<td>Frequency</td>
<td>SD</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>30</td>
<td>I get to know my group members well.</td>
<td>4.05</td>
<td>59</td>
<td>.753</td>
</tr>
<tr>
<td>31</td>
<td>When I work in a group, I get the grade I deserve.</td>
<td>3.90</td>
<td>59</td>
<td>.845</td>
</tr>
<tr>
<td>32</td>
<td>When I work in a group, there are opportunities to express my opinions.</td>
<td>4.17</td>
<td>59</td>
<td>.791</td>
</tr>
<tr>
<td>33</td>
<td>We can not complete the assignment unless everyone contributes,</td>
<td>3.68</td>
<td>59</td>
<td>1.041</td>
</tr>
<tr>
<td>34</td>
<td>My group members do not like me. <em>(My group members like me.)</em></td>
<td>4.25</td>
<td>59</td>
<td>.709</td>
</tr>
<tr>
<td>35</td>
<td>I help my group members with what I am good at.</td>
<td>4.27</td>
<td>59</td>
<td>.691</td>
</tr>
<tr>
<td>36</td>
<td>I have to work with other students who are not as smart as I am. <em>(I have to work with other students who are as smart as I am.)</em></td>
<td>3.81</td>
<td>59</td>
<td>1.042</td>
</tr>
<tr>
<td>37</td>
<td>Some group members forget to do the work. <em>(Group members remember to do the work.)</em></td>
<td>3.44</td>
<td>59</td>
<td>1.134</td>
</tr>
<tr>
<td>38</td>
<td>It is important to me that my group gets the work done on time.</td>
<td>4.49</td>
<td>59</td>
<td>.537</td>
</tr>
<tr>
<td>39</td>
<td>I am forced to work with students I do not like. <em>(I am not forced to work with students I do not like.)</em></td>
<td>4.36</td>
<td>59</td>
<td>.609</td>
</tr>
<tr>
<td>40</td>
<td>When I work with other students we spend too much time talking about other things. <em>(When I work with other students we do not spend too much time talking about other things.)</em></td>
<td>4.03</td>
<td>59</td>
<td>.830</td>
</tr>
<tr>
<td>41</td>
<td>I also learn when I teach the material to my group members.</td>
<td>3.88</td>
<td>59</td>
<td>.832</td>
</tr>
<tr>
<td>42</td>
<td>Everyone’s ideas are needed if we are going to be successful.</td>
<td>4.49</td>
<td>59</td>
<td>.504</td>
</tr>
<tr>
<td>43</td>
<td>I prefer to choose the students I work with. <em>(I do not prefer to choose the students I work with.)</em></td>
<td>2.86</td>
<td>59</td>
<td>1.293</td>
</tr>
</tbody>
</table>

Note: N= Frequency; SD = Standard Deviation. * Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table D2

**Subscale 1 - Quality of Product and Process for the Traditional Setting**

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Traditional</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The material is more interesting to me when I work with other students.</td>
<td>76.7</td>
<td>15.0</td>
<td>8.3</td>
</tr>
<tr>
<td>2</td>
<td>I enjoy the material more when I work with other students.</td>
<td>80.0</td>
<td>5.0</td>
<td>15.0</td>
</tr>
<tr>
<td>4</td>
<td>When I work in a group, my work habits improve.</td>
<td>83.3</td>
<td>6.7</td>
<td>10.0</td>
</tr>
<tr>
<td>5</td>
<td>When I work in a group, I do better quality work.</td>
<td>66.7</td>
<td>16.7</td>
<td>16.7</td>
</tr>
<tr>
<td>6</td>
<td>The work load is usually less when I work with other students.</td>
<td>68.3</td>
<td>15.0</td>
<td>16.7</td>
</tr>
<tr>
<td>8</td>
<td>I feel working in groups is a waste of time. <em>(I do not feel working in groups is a waste of time.)</em></td>
<td>88.3</td>
<td>10.0</td>
<td>1.7</td>
</tr>
<tr>
<td>9</td>
<td>My grades improve when I work with other students.</td>
<td>56.7</td>
<td>25.0</td>
<td>18.3</td>
</tr>
<tr>
<td>10</td>
<td>The work takes longer to complete when I work with other students. <em>(The work does not take longer to complete when I work with other students.)</em></td>
<td>81.4</td>
<td>13.6</td>
<td>5.1</td>
</tr>
<tr>
<td>11</td>
<td>The material is easier to understand when I work with other students.</td>
<td>74.6</td>
<td>11.9</td>
<td>13.6</td>
</tr>
<tr>
<td>12</td>
<td>It takes less time to complete the assignment when I work with others.</td>
<td>72.9</td>
<td>8.5</td>
<td>18.6</td>
</tr>
<tr>
<td>13</td>
<td>My group's members help explain things that I do not understand.</td>
<td>76.3</td>
<td>8.5</td>
<td>15.3</td>
</tr>
<tr>
<td>14</td>
<td>I learn more information when I work with other students.</td>
<td>72.9</td>
<td>13.6</td>
<td>13.6</td>
</tr>
<tr>
<td>16</td>
<td>My work is better organized when I work in a group.</td>
<td>50.8</td>
<td>27.1</td>
<td>22.0</td>
</tr>
<tr>
<td>24</td>
<td>My group members like to help me learn the material.</td>
<td>72.9</td>
<td>16.9</td>
<td>10.2</td>
</tr>
<tr>
<td>31</td>
<td>When I work in a group, I get the grade I deserve.</td>
<td>76.3</td>
<td>15.3</td>
<td>8.5</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.
*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table D3

Subscale 2 - Peer Support for the Traditional Setting

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Traditional</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>My group members do not care about my feelings. *(My group members care about my feelings.)</td>
<td>85.0</td>
<td>10.0</td>
<td>5.0</td>
</tr>
<tr>
<td>15</td>
<td>I become frustrated when my group members do not understand the material. *(I do not become frustrated when my group members do not understand the material.)</td>
<td>88.1</td>
<td>3.4</td>
<td>8.5</td>
</tr>
<tr>
<td>19</td>
<td>My group members do not respect my opinion. *(My group members respect my opinion.)</td>
<td>93.2</td>
<td>5.1</td>
<td>1.7</td>
</tr>
<tr>
<td>20</td>
<td>My group members make me feel that I am not as smart as they are. *(My group members do not make me feel that I am not as smart as they are.)</td>
<td>91.5</td>
<td>3.4</td>
<td>5.1</td>
</tr>
<tr>
<td>23</td>
<td>I find it hard to express my thoughts when I work in a group. *(I do not find it hard to express my thoughts when I work in a group.)</td>
<td>93.2</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>25</td>
<td>I feel I am part of what is going on in the group.</td>
<td>94.9</td>
<td>1.7</td>
<td>3.4</td>
</tr>
<tr>
<td>32</td>
<td>When I work in a group, there are opportunities to express my opinions.</td>
<td>89.8</td>
<td>3.4</td>
<td>6.8</td>
</tr>
<tr>
<td>34</td>
<td>My group members do not like me. *(My group members like me.)</td>
<td>93.2</td>
<td>5.1</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.
*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
### Table D4

**Subscale 3 - Student Interdependence for the Traditional Setting**

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Traditional</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Agree + SA</td>
<td>U</td>
<td>Disagree + Strongly Disagree</td>
</tr>
<tr>
<td>7</td>
<td>I let the other students do most of the work. <em>(I do not let the other students do most of the work.)</em></td>
<td>91.7</td>
<td>6.7</td>
<td>1.7</td>
</tr>
<tr>
<td>17</td>
<td>I do not care if group members get good grades. <em>(I care if group members get good grades.)</em></td>
<td>88.1</td>
<td>5.1</td>
<td>6.8</td>
</tr>
<tr>
<td>21</td>
<td>I become friendly with my group members.</td>
<td>98.3</td>
<td>1.7</td>
<td>0.0</td>
</tr>
<tr>
<td>26</td>
<td>Our job is not done until everyone has finished the assignment.</td>
<td>98.3</td>
<td>1.7</td>
<td>0.0</td>
</tr>
<tr>
<td>27</td>
<td>My grade depends on how much we all learn.</td>
<td>45.8</td>
<td>27.1</td>
<td>27.1</td>
</tr>
<tr>
<td>28</td>
<td>I learn to work with students who are different from me.</td>
<td>94.9</td>
<td>3.4</td>
<td>1.7</td>
</tr>
<tr>
<td>30</td>
<td>I get to know my group members well.</td>
<td>84.7</td>
<td>10.2</td>
<td>5.1</td>
</tr>
<tr>
<td>33</td>
<td>We can not complete the assignment unless everyone contributes,</td>
<td>66.1</td>
<td>13.6</td>
<td>20.3</td>
</tr>
<tr>
<td>35</td>
<td>I help my group members with what I am good at.</td>
<td>93.2</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>38</td>
<td>It is important to me that my group gets the work done on time.</td>
<td>98.3</td>
<td>1.7</td>
<td>0.0</td>
</tr>
<tr>
<td>41</td>
<td>I also learn when I teach the material to my group members.</td>
<td>78.0</td>
<td>15.3</td>
<td>6.8</td>
</tr>
<tr>
<td>42</td>
<td>Everyone's ideas are needed if we are going to be successful.</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Note: A+SA = Agree + Strongly Agree; U = Undecided; D+SD = Disagree + Strongly Disagree.

*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.*
Table D5

Subscale 4 - Frustration with Group Members for the Traditional Setting

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Traditional</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A+SA</td>
<td>U</td>
<td>D+SD</td>
</tr>
<tr>
<td>18</td>
<td>When I work in groups I want to be with my friends. *(When I work in groups I do not want to be with my friends.)</td>
<td>42.4</td>
<td>20.3</td>
<td>37.3</td>
</tr>
<tr>
<td>22</td>
<td>When I work in a group, I am able to share my ideas.</td>
<td>98.3</td>
<td>1.7</td>
<td>0.0</td>
</tr>
<tr>
<td>29</td>
<td>I do not like the students I am assigned to work with. *(I like the students I am assigned to work with.)</td>
<td>91.5</td>
<td>5.1</td>
<td>3.4</td>
</tr>
<tr>
<td>36</td>
<td>I have to work with other students who are not as smart as I am. *(I have to work with other students who are as smart as I am.)</td>
<td>67.8</td>
<td>18.6</td>
<td>13.6</td>
</tr>
<tr>
<td>37</td>
<td>Some group members forget to do the work. *(Group members remember to do the work.)</td>
<td>57.6</td>
<td>20.3</td>
<td>22.0</td>
</tr>
<tr>
<td>39</td>
<td>I am forced to work with students I do not like. *(I am not forced to work with students I do not like.)</td>
<td>96.6</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>40</td>
<td>When I work with other students we spend too much time talking about other things. *(When I work with other students we do not spend too much time talking about other things.)</td>
<td>81.4</td>
<td>11.9</td>
<td>6.8</td>
</tr>
<tr>
<td>43</td>
<td>I prefer to choose the students I work with. *(I do not prefer to choose the students I work with.)</td>
<td>45.8</td>
<td>5.1</td>
<td>49.2</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree. *Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
## APPENDIX E

### DESCRIPTIVE DATA FROM SAGE FOR THE ONLINE SETTING

Table E1

*Mean and Standard Deviations for the Online Setting*

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Mean</th>
<th>N</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The material is more interesting to me when I work with other students.</td>
<td>3.53</td>
<td>19</td>
<td>1.020</td>
</tr>
<tr>
<td>2</td>
<td>I enjoy the material more when I work with other students.</td>
<td>3.63</td>
<td>19</td>
<td>.955</td>
</tr>
<tr>
<td>3</td>
<td>My group members do not care about my feelings. <em>(My group members care about my feelings.)</em></td>
<td>4.00</td>
<td>19</td>
<td>.816</td>
</tr>
<tr>
<td>4</td>
<td>When I work in a group, my work habits improve.</td>
<td>3.95</td>
<td>19</td>
<td>.848</td>
</tr>
<tr>
<td>5</td>
<td>When I work in a group, I do better quality work.</td>
<td>3.74</td>
<td>19</td>
<td>1.240</td>
</tr>
<tr>
<td>6</td>
<td>The work load is usually less when I work with other students.</td>
<td>3.42</td>
<td>19</td>
<td>1.305</td>
</tr>
<tr>
<td>7</td>
<td>I let the other students do most of the work. <em>(I do not let the other students do most of the work.)</em></td>
<td>4.53</td>
<td>19</td>
<td>.772</td>
</tr>
<tr>
<td>8</td>
<td>I feel working in groups is a waste of time. <em>(I do not feel working in groups is a waste of time.)</em></td>
<td>4.11</td>
<td>19</td>
<td>1.100</td>
</tr>
<tr>
<td>9</td>
<td>My grades improve when I work with other students.</td>
<td>3.63</td>
<td>19</td>
<td>1.165</td>
</tr>
<tr>
<td>10</td>
<td>The work takes longer to complete when I work with other students. <em>(The work does not take longer to complete when I work with other students.)</em></td>
<td>3.37</td>
<td>19</td>
<td>1.065</td>
</tr>
<tr>
<td>11</td>
<td>The material is easier to understand when I work with other students.</td>
<td>3.42</td>
<td>19</td>
<td>1.121</td>
</tr>
<tr>
<td>12</td>
<td>It takes less time to complete the assignment when I work with others.</td>
<td>3.21</td>
<td>19</td>
<td>1.316</td>
</tr>
<tr>
<td>13</td>
<td>My group's members help explain things that I do not understand.</td>
<td>3.79</td>
<td>19</td>
<td>1.032</td>
</tr>
<tr>
<td>14</td>
<td>I learn more information when I work with other students.</td>
<td>3.95</td>
<td>19</td>
<td>.848</td>
</tr>
</tbody>
</table>
Table E1 (continued).

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>Mean</th>
<th>N</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>I become frustrated when my group members do not understand the material. *(I do not become frustrated when my group members do not understand the material.)</td>
<td>3.42</td>
<td>19</td>
<td>1.071</td>
</tr>
<tr>
<td>16</td>
<td>My work is better organized when I work in a group.</td>
<td>3.68</td>
<td>19</td>
<td>1.057</td>
</tr>
<tr>
<td>17</td>
<td>I do not care if group members get good grades. *(I care if group members get good grades.)</td>
<td>4.00</td>
<td>19</td>
<td>1.000</td>
</tr>
<tr>
<td>18</td>
<td>When I work in groups I want to be with my friends. *(When I work in groups I do not want to be with my friends.)</td>
<td>2.79</td>
<td>19</td>
<td>1.084</td>
</tr>
<tr>
<td>19</td>
<td>My group members do not respect my opinion. *(My group members respect my opinion.)</td>
<td>4.05</td>
<td>19</td>
<td>.780</td>
</tr>
<tr>
<td>20</td>
<td>My group members make me feel that I am not as smart as they are. *(My group members do not make me feel that I am not as smart as they are.)</td>
<td>4.26</td>
<td>19</td>
<td>.653</td>
</tr>
<tr>
<td>21</td>
<td>I become friendly with my group members.</td>
<td>4.00</td>
<td>19</td>
<td>.667</td>
</tr>
<tr>
<td>22</td>
<td>When I work in a group, I am able to share my ideas.</td>
<td>4.21</td>
<td>19</td>
<td>.535</td>
</tr>
<tr>
<td>23</td>
<td>I find it hard to express my thoughts when I work in a group. *(I do not find it hard to express my thoughts when I work in a group.)</td>
<td>4.16</td>
<td>19</td>
<td>.501</td>
</tr>
<tr>
<td>24</td>
<td>My group members like to help me learn the material.</td>
<td>3.42</td>
<td>19</td>
<td>.838</td>
</tr>
<tr>
<td>25</td>
<td>I feel I am part of what is going on in the group.</td>
<td>4.26</td>
<td>19</td>
<td>.452</td>
</tr>
<tr>
<td>26</td>
<td>Our job is not done until everyone has finished the assignment.</td>
<td>4.32</td>
<td>19</td>
<td>.582</td>
</tr>
<tr>
<td>27</td>
<td>My grade depends on how much we all learn.</td>
<td>3.32</td>
<td>19</td>
<td>1.204</td>
</tr>
<tr>
<td>28</td>
<td>I learn to work with students who are different from me.</td>
<td>4.16</td>
<td>19</td>
<td>.501</td>
</tr>
<tr>
<td>29</td>
<td>I do not like the students I am assigned to work with. *(I like the students I am assigned to work with.)</td>
<td>4.16</td>
<td>19</td>
<td>.602</td>
</tr>
<tr>
<td>30</td>
<td>I get to know my group members well.</td>
<td>3.00</td>
<td>19</td>
<td>1.106</td>
</tr>
<tr>
<td>31</td>
<td>When I work in a group, I get the grade I deserve.</td>
<td>3.95</td>
<td>19</td>
<td>.970</td>
</tr>
<tr>
<td>Item</td>
<td>Statement</td>
<td>Mean</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>When I work in a group, there are opportunities to express my opinions.</td>
<td>4.05</td>
<td>.780</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>We can not complete the assignment unless everyone contributes,</td>
<td>4.05</td>
<td>1.079</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>My group members do not like me. <em>(My group members like me.)</em></td>
<td>4.21</td>
<td>.631</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>I help my group members with what I am good at.</td>
<td>4.21</td>
<td>.419</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>I have to work with other students who are not as smart as I am. <em>(I have to work with other students who are as smart as I am.)</em></td>
<td>3.53</td>
<td>1.020</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Some group members forget to do the work. <em>(Group members remember to do the work.)</em></td>
<td>2.68</td>
<td>1.003</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>It is important to me that my group gets the work done on time.</td>
<td>4.53</td>
<td>.513</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>I am forced to work with students I do not like. <em>(I am not forced to work with students I do not like.)</em></td>
<td>4.16</td>
<td>.834</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>When I work with other students we spend too much time talking about other things. <em>(When I work with other students we do not spend too much time talking about other things.)</em></td>
<td>4.00</td>
<td>.943</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>I also learn when I teach the material to my group members.</td>
<td>4.21</td>
<td>.713</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Everyone’s ideas are needed if we are going to be successful.</td>
<td>4.21</td>
<td>.787</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>I prefer to choose the students I work with. <em>(I do not prefer to choose the students I work with.)</em></td>
<td>2.47</td>
<td>1.073</td>
<td></td>
</tr>
</tbody>
</table>

Note: N= Frequency; SD = Standard Deviation. * Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Percentage Agree, Disagree, and Undecided for the Online Setting by Subscale

Table E2

Subscale 1 - Quality of Product and Process for the Online Setting

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Online</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The material is more interesting to me when I work with other students.</td>
<td>68.4</td>
<td>5.3</td>
<td>26.3</td>
</tr>
<tr>
<td>2</td>
<td>I enjoy the material more when I work with other students.</td>
<td>73.7</td>
<td>5.3</td>
<td>21.1</td>
</tr>
<tr>
<td>4</td>
<td>When I work in a group, my work habits improve.</td>
<td>84.2</td>
<td>5.3</td>
<td>10.5</td>
</tr>
<tr>
<td>5</td>
<td>When I work in a group, I do better quality work.</td>
<td>63.2</td>
<td>10.5</td>
<td>26.3</td>
</tr>
<tr>
<td>6</td>
<td>The work load is usually less when I work with other students.</td>
<td>57.9</td>
<td>15.8</td>
<td>26.3</td>
</tr>
<tr>
<td>8</td>
<td>I feel working in groups is a waste of time. *(I do not feel working in groups is a waste of time.)</td>
<td>84.2</td>
<td>5.3</td>
<td>10.5</td>
</tr>
<tr>
<td>9</td>
<td>My grades improve when I work with other students.</td>
<td>57.9</td>
<td>26.3</td>
<td>15.8</td>
</tr>
<tr>
<td>10</td>
<td>The work takes longer to complete when I work with other students. *(The work does not take longer to complete when I work with other students.)</td>
<td>57.9</td>
<td>10.5</td>
<td>31.6</td>
</tr>
<tr>
<td>11</td>
<td>The material is easier to understand when I work with other students.</td>
<td>52.6</td>
<td>26.3</td>
<td>21.1</td>
</tr>
<tr>
<td>12</td>
<td>It takes less time to complete the assignment when I work with others.</td>
<td>47.4</td>
<td>10.5</td>
<td>42.1</td>
</tr>
<tr>
<td>13</td>
<td>My group’s members help explain things that I do not understand.</td>
<td>84.2</td>
<td>0.0</td>
<td>15.8</td>
</tr>
<tr>
<td>14</td>
<td>I learn more information when I work with other students.</td>
<td>84.2</td>
<td>5.3</td>
<td>10.5</td>
</tr>
<tr>
<td>16</td>
<td>My work is better organized when I work in a group.</td>
<td>57.9</td>
<td>26.3</td>
<td>15.8</td>
</tr>
<tr>
<td>24</td>
<td>My group members like to help me learn the material.</td>
<td>52.6</td>
<td>31.6</td>
<td>15.8</td>
</tr>
<tr>
<td>31</td>
<td>When I work in a group, I get the grade I deserve.</td>
<td>73.7</td>
<td>15.8</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.
*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table E3

**Subscale 2 - Peer Support for the Online Setting**

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>A+SA</th>
<th>U</th>
<th>D+SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>My group members do not care about my feelings. <em>(My group members care about my feelings.)</em></td>
<td>68.4</td>
<td>31.6</td>
<td>0.0</td>
</tr>
<tr>
<td>15</td>
<td>I become frustrated when my group members do not understand the material. <em>(I do not become frustrated when my group members do not understand the material.)</em></td>
<td>57.9</td>
<td>21.1</td>
<td>21.1</td>
</tr>
<tr>
<td>19</td>
<td>My group members do not respect my opinion. <em>(My group members respect my opinion.)</em></td>
<td>73.7</td>
<td>26.3</td>
<td>0.0</td>
</tr>
<tr>
<td>20</td>
<td>My group members make me feel that I am not as smart as they are. <em>(My group members do not make me feel that I am not as smart as they are.)</em></td>
<td>89.2</td>
<td>10.5</td>
<td>0.0</td>
</tr>
<tr>
<td>23</td>
<td>I find it hard to express my thoughts when I work in a group. <em>(I do not find it hard to express my thoughts when I work in a group.)</em></td>
<td>94.7</td>
<td>5.3</td>
<td>0.0</td>
</tr>
<tr>
<td>25</td>
<td>I feel I am part of what is going on in the group.</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>32</td>
<td>When I work in a group, there are opportunities to express my opinions.</td>
<td>84.2</td>
<td>10.5</td>
<td>5.3</td>
</tr>
<tr>
<td>34</td>
<td>My group members do not like me. <em>(My group members like me.)</em></td>
<td>89.5</td>
<td>10.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.  
*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table E4

*Subscale 3 - Student Interdependence for the Online Setting*

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Online</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>I do not care if group members get good grades. * *(I care if group members get good grades.)</td>
<td>78.9</td>
<td>15.8</td>
<td>5.3</td>
</tr>
<tr>
<td>21</td>
<td>I become friendly with my group members.</td>
<td>89.5</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>26</td>
<td>Our job is not done until everyone has finished the assignment.</td>
<td>94.7</td>
<td>5.3</td>
<td>0.0</td>
</tr>
<tr>
<td>27</td>
<td>My grade depends on how much we all learn.</td>
<td>57.9</td>
<td>15.8</td>
<td>26.3</td>
</tr>
<tr>
<td>28</td>
<td>I learn to work with students who are different from me.</td>
<td>94.7</td>
<td>5.3</td>
<td>0.0</td>
</tr>
<tr>
<td>30</td>
<td>I get to know my group members well.</td>
<td>31.6</td>
<td>31.6</td>
<td>36.8</td>
</tr>
<tr>
<td>33</td>
<td>We can not complete the assignment unless everyone contributes,</td>
<td>78.9</td>
<td>5.3</td>
<td>15.8</td>
</tr>
<tr>
<td>35</td>
<td>I help my group members with what I am good at.</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>38</td>
<td>It is important to me that my group gets the work done on time.</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>41</td>
<td>I also learn when I teach the material to my group members.</td>
<td>84.2</td>
<td>15.8</td>
<td>0.0</td>
</tr>
<tr>
<td>42</td>
<td>Everyone's ideas are needed if we are going to be successful.</td>
<td>89.5</td>
<td>5.3</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.
*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table E5

*Subscale 4 - Frustration with Group Members for the Online Setting*

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Online</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>When I work in a group, I am able to share my ideas.</td>
<td>A+SA 94.7, U 5.3, D+SD 0.0</td>
</tr>
<tr>
<td>29</td>
<td>I do not like the students I am assigned to work with. <em>(I like the students I am assigned to work with.)</em></td>
<td>A+SA 89.5, U 10.5, D+SD 0.0</td>
</tr>
<tr>
<td>36</td>
<td>I have to work with other students who are not as smart as I am. <em>(I have to work with other students who are as smart as I am.)</em></td>
<td>A+SA 47.4, U 36.8, D+SD 15.8</td>
</tr>
<tr>
<td>37</td>
<td>Some group members forget to do the work. <em>(Group members remember to do the work.)</em></td>
<td>A+SA 21.1, U 26.3, D+SD 52.6</td>
</tr>
<tr>
<td>39</td>
<td>I am forced to work with students I do not like. <em>(I am not forced to work with students I do not like.)</em></td>
<td>A+SA 84.2, U 10.5, D+SD 5.3</td>
</tr>
<tr>
<td>40</td>
<td>When I work with other students we spend too much time talking about other things. <em>(When I work with other students we do not spend too much time talking about other things.)</em></td>
<td>A+SA 78.9, U 10.5, D+SD 10.5</td>
</tr>
<tr>
<td>43</td>
<td>I prefer to choose the students I work with. <em>(I do not prefer to choose the students I work with.)</em></td>
<td>A+SA 21.1, U 26.3, D+SD 52.6</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.

*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.*
APPENDIX F

DESCRIPTIVE DATA FROM SAGE FOR THE HYBRID SETTING

Table F1

Mean and Standard Deviations for the Hybrid Setting

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Mean</th>
<th>N</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The material is more interesting to me when I work with other students.</td>
<td>3.67</td>
<td>33</td>
<td>1.315</td>
</tr>
<tr>
<td>2</td>
<td>I enjoy the material more when I work with other students.</td>
<td>3.97</td>
<td>33</td>
<td>1.045</td>
</tr>
<tr>
<td>3</td>
<td>My group members do not care about my feelings. <em>(My group members care about my feelings.)</em></td>
<td>4.30</td>
<td>33</td>
<td>.637</td>
</tr>
<tr>
<td>4</td>
<td>When I work in a group, my work habits improve.</td>
<td>3.73</td>
<td>33</td>
<td>.977</td>
</tr>
<tr>
<td>5</td>
<td>When I work in a group, I do better quality work.</td>
<td>3.70</td>
<td>33</td>
<td>1.159</td>
</tr>
<tr>
<td>6</td>
<td>The work load is usually less when I work with other students.</td>
<td>3.85</td>
<td>33</td>
<td>.906</td>
</tr>
<tr>
<td>7</td>
<td>I let the other students do most of the work. <em>(I do not let the other students do most of the work.)</em></td>
<td>4.42</td>
<td>33</td>
<td>.561</td>
</tr>
<tr>
<td>8</td>
<td>I feel working in groups is a waste of time. <em>(I do not feel working in groups is a waste of time.)</em></td>
<td>4.09</td>
<td>33</td>
<td>.879</td>
</tr>
<tr>
<td>9</td>
<td>My grades improve when I work with other students.</td>
<td>3.39</td>
<td>33</td>
<td>.966</td>
</tr>
<tr>
<td>10</td>
<td>The work takes longer to complete when I work with other students. <em>(The work does not take longer to complete when I work with other students.)</em></td>
<td>3.73</td>
<td>33</td>
<td>1.098</td>
</tr>
<tr>
<td>11</td>
<td>The material is easier to understand when I work with other students.</td>
<td>3.73</td>
<td>33</td>
<td>.911</td>
</tr>
<tr>
<td>12</td>
<td>It takes less time to complete the assignment when I work with others.</td>
<td>4.00</td>
<td>33</td>
<td>1.146</td>
</tr>
<tr>
<td>13</td>
<td>My group's members help explain things that I do not understand.</td>
<td>3.94</td>
<td>33</td>
<td>.609</td>
</tr>
<tr>
<td>14</td>
<td>I learn more information when I work with other students.</td>
<td>3.82</td>
<td>33</td>
<td>.846</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Mean</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>I become frustrated when my group members do not understand the material. <em>(I do not become frustrated when my group members do not understand the material.)</em></td>
<td>3.45</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>My work is better organized when I work in a group.</td>
<td>3.33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>I do not care if group members get good grades. <em>(I care if group members get good grades.)</em></td>
<td>4.36</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>When I work in groups I want to be with my friends. <em>(When I work in groups I do not want to be with my friends.)</em></td>
<td>2.58</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>My group members do not respect my opinion. <em>(My group members respect my opinion.)</em></td>
<td>4.42</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>My group members make me feel that I am not as smart as they are. <em>(My group members do not make me feel that I am not as smart as they are.)</em></td>
<td>4.27</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>I become friendly with my group members.</td>
<td>4.21</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>When I work in a group, I am able to share my ideas.</td>
<td>4.18</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>I find it hard to express my thoughts when I work in a group. <em>(I do not find it hard to express my thoughts when I work in a group.)</em></td>
<td>4.21</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>My group members like to help me learn the material.</td>
<td>3.79</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>I feel I am part of what is going on in the group.</td>
<td>4.33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Our job is not done until everyone has finished the assignment.</td>
<td>4.27</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>My grade depends on how much we all learn.</td>
<td>3.21</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>I learn to work with students who are different from me.</td>
<td>4.19</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>I do not like the students I am assigned to work with. <em>(I like the students I am assigned to work with.)</em></td>
<td>4.45</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>I get to know my group members well.</td>
<td>3.82</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>
Table F1 (continued).

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Mean</th>
<th>Frequency</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>When I work in a group, I get the grade I deserve.</td>
<td>3.70</td>
<td>33</td>
<td>.883</td>
</tr>
<tr>
<td>32</td>
<td>When I work in a group, there are opportunities to express my opinions.</td>
<td>4.33</td>
<td>33</td>
<td>.479</td>
</tr>
<tr>
<td>33</td>
<td>We can not complete the assignment unless everyone contributes,</td>
<td>3.27</td>
<td>33</td>
<td>1.306</td>
</tr>
<tr>
<td>34</td>
<td>My group members do not like me. <em>(My group members like me.)</em></td>
<td>4.42</td>
<td>33</td>
<td>.502</td>
</tr>
<tr>
<td>35</td>
<td>I help my group members with what I am good at.</td>
<td>4.27</td>
<td>33</td>
<td>.761</td>
</tr>
<tr>
<td>36</td>
<td>I have to work with other students who are not as smart as I am. <em>(I have to work with other students who are as smart as I am.)</em></td>
<td>3.42</td>
<td>33</td>
<td>.969</td>
</tr>
<tr>
<td>37</td>
<td>Some group members forget to do the work. <em>(Group members remember to do the work.)</em></td>
<td>3.30</td>
<td>33</td>
<td>1.159</td>
</tr>
<tr>
<td>38</td>
<td>It is important to me that my group gets the work done on time.</td>
<td>4.45</td>
<td>33</td>
<td>.506</td>
</tr>
<tr>
<td>39</td>
<td>I am forced to work with students I do not like. <em>(I am not forced to work with students I do not like.)</em></td>
<td>4.30</td>
<td>33</td>
<td>.637</td>
</tr>
<tr>
<td>40</td>
<td>When I work with other students we spend too much time talking about other things. <em>(When I work with other students we do not spend too much time talking about other things.)</em></td>
<td>4.03</td>
<td>33</td>
<td>.918</td>
</tr>
<tr>
<td>41</td>
<td>I also learn when I teach the material to my group members.</td>
<td>4.09</td>
<td>33</td>
<td>.631</td>
</tr>
<tr>
<td>42</td>
<td>Everyone’s ideas are needed if we are going to be successful.</td>
<td>4.00</td>
<td>33</td>
<td>1.090</td>
</tr>
<tr>
<td>43</td>
<td>I prefer to choose the students I work with. <em>(I do not prefer to choose the students I work with.)</em></td>
<td>2.24</td>
<td>33</td>
<td>1.062</td>
</tr>
</tbody>
</table>

Note: N= Frequency; SD = Standard Deviation. * Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Percentage Agree, Disagree, and Undecided for the Hybrid Setting by Subscale

Table F2

Subscale 1 - Quality of Product and Process for the Hybrid Setting

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Hybrid</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A+SA</td>
<td>U</td>
<td>D+SD</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>The material is more interesting to me when I work with other students.</td>
<td>66.7</td>
<td>6.1</td>
<td>27.3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I enjoy the material more when I work with other students.</td>
<td>78.8</td>
<td>9.1</td>
<td>12.1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>When I work in a group, my work habits improve.</td>
<td>60.6</td>
<td>27.3</td>
<td>12.1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>When I work in a group, I do better quality work.</td>
<td>60.6</td>
<td>21.2</td>
<td>18.2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>The work load is usually less when I work with other students.</td>
<td>81.8</td>
<td>3.0</td>
<td>15.2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>I feel working in groups is a waste of time. <em>(I do not feel working in groups is a waste of time.)</em></td>
<td>81.8</td>
<td>15.2</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>My grades improve when I work with other students.</td>
<td>42.4</td>
<td>39.4</td>
<td>18.2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>The work takes longer to complete when I work with other students. <em>(The work does not take longer to complete when I work with other students.)</em></td>
<td>72.7</td>
<td>12.1</td>
<td>15.2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>The material is easier to understand when I work with other students.</td>
<td>60.6</td>
<td>30.3</td>
<td>9.1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>It takes less time to complete the assignment when I work with others.</td>
<td>75.8</td>
<td>9.1</td>
<td>15.2</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>My group's members help explain things that I do not understand.</td>
<td>78.8</td>
<td>21.2</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>I learn more information when I work with other students.</td>
<td>75.8</td>
<td>18.2</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>My work is better organized when I work in a group.</td>
<td>51.5</td>
<td>21.2</td>
<td>27.3</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>My group members like to help me learn the material.</td>
<td>69.7</td>
<td>24.2</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>When I work in a group, I get the grade I deserve.</td>
<td>69.7</td>
<td>21.2</td>
<td>9.1</td>
<td></td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.
*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
## Table F3

Subscale 2 - Peer Support for the Hybrid Setting

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A+SA</td>
</tr>
<tr>
<td>3</td>
<td>My group members do not care about my feelings. <em>(My group members care about my feelings.)</em></td>
<td>90.9</td>
</tr>
<tr>
<td>15</td>
<td>I become frustrated when my group members do not understand the material. <em>(I do not become frustrated when my group members do not understand the material.)</em></td>
<td>60.6</td>
</tr>
<tr>
<td>19</td>
<td>My group members do not respect my opinion. <em>(My group members respect my opinion.)</em></td>
<td>97.0</td>
</tr>
<tr>
<td>20</td>
<td>My group members make me feel that I am not as smart as they are. <em>(My group members do not make me feel that I am not as smart as they are.)</em></td>
<td>90.9</td>
</tr>
<tr>
<td>23</td>
<td>I find it hard to express my thoughts when I work in a group. <em>(I do not find it hard to express my thoughts when I work in a group.)</em></td>
<td>93.9</td>
</tr>
<tr>
<td>25</td>
<td>I feel I am part of what is going on in the group.</td>
<td>97.0</td>
</tr>
<tr>
<td>32</td>
<td>When I work in a group, there are opportunities to express my opinions.</td>
<td>100.0</td>
</tr>
<tr>
<td>34</td>
<td>My group members do not like me. <em>(My group members like me.)</em></td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree.
*Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
**Table F4**

*Subscale 3 - Student Interdependence for the Hybrid Setting*

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Hybrid</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>I let the other students do most of the work. <em>(I do not let the other students do most of the work.)</em></td>
<td>97.0</td>
<td>3.0</td>
<td>0.0</td>
</tr>
<tr>
<td>17</td>
<td>I do not care if group members get good grades. <em>(I care if group members get good grades.)</em></td>
<td>93.9</td>
<td>3.1</td>
<td>3.1</td>
</tr>
<tr>
<td>21</td>
<td>I become friendly with my group members.</td>
<td>93.9</td>
<td>6.1</td>
<td>0.0</td>
</tr>
<tr>
<td>26</td>
<td>Our job is not done until everyone has finished the assignment.</td>
<td>97.0</td>
<td>0.0</td>
<td>3.0</td>
</tr>
<tr>
<td>27</td>
<td>My grade depends on how much we all learn.</td>
<td>39.4</td>
<td>33.3</td>
<td>27.3</td>
</tr>
<tr>
<td>28</td>
<td>I learn to work with students who are different from me.</td>
<td>93.8</td>
<td>6.3</td>
<td>0.0</td>
</tr>
<tr>
<td>30</td>
<td>I get to know my group members well.</td>
<td>75.8</td>
<td>18.2</td>
<td>6.1</td>
</tr>
<tr>
<td>33</td>
<td>We can not complete the assignment unless everyone contributes,</td>
<td>48.5</td>
<td>18.2</td>
<td>33.3</td>
</tr>
<tr>
<td>35</td>
<td>I help my group members with what I am good at.</td>
<td>97.0</td>
<td>0.0</td>
<td>3.0</td>
</tr>
<tr>
<td>38</td>
<td>It is important to me that my group gets the work done on time.</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>41</td>
<td>I also learn when I teach the material to my group members.</td>
<td>90.9</td>
<td>6.1</td>
<td>3.0</td>
</tr>
<tr>
<td>42</td>
<td>Everyone’s ideas are needed if we are going to be successful.</td>
<td>84.8</td>
<td>3.1</td>
<td>12.1</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree. *Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
Table F5

Subscale 4 - Frustration with Group Members for the Hybrid Setting

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Stem</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>When I work in groups I want to be with my friends. *(When I work in groups I do not want to be with my friends.)</td>
<td>18.2 21.2 60.6</td>
</tr>
<tr>
<td>22</td>
<td>When I work in a group, I am able to share my ideas.</td>
<td>100.0 0.0 0.0</td>
</tr>
<tr>
<td>29</td>
<td>I do not like the students I am assigned to work with. *(I like the students I am assigned to work with.)</td>
<td>93.9 6.1 0.0</td>
</tr>
<tr>
<td>36</td>
<td>I have to work with other students who are not as smart as I am. *(I have to work with other students who are as smart as I am.)</td>
<td>60.6 18.2 21.2</td>
</tr>
<tr>
<td>37</td>
<td>Some group members forget to do the work. *(Group members remember to do the work.)</td>
<td>54.5 15.2 30.3</td>
</tr>
<tr>
<td>39</td>
<td>I am forced to work with students I do not like. *(I am not forced to work with students I do not like.)</td>
<td>90.9 9.1 0.0</td>
</tr>
<tr>
<td>40</td>
<td>When I work with other students we spend too much time talking about other things. *(When I work with other students we do not spend too much time talking about other things.)</td>
<td>84.8 3.0 12.1</td>
</tr>
<tr>
<td>43</td>
<td>I prefer to choose the students I work with. *(I do not prefer to choose the students I work with.)</td>
<td>15.2 15.2 69.7</td>
</tr>
</tbody>
</table>

Note: A+SA= Agree + Strongly Agree; U=Undecided; D+SD=Disagree + Strongly Disagree. *Items negatively worded on the SAGE questionnaire. Reverse coded for all analyses.
### APPENDIX G

**DESCRIPTIVE DATA FOR ACHIEVEMENT ANALYSES**

#### Table G1

*Mean and Standard Deviation by Design for Achievement Analyses*

<table>
<thead>
<tr>
<th>Design</th>
<th>Pre-test Score</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td></td>
<td>22</td>
<td>2.05</td>
<td>1.046</td>
</tr>
<tr>
<td></td>
<td>Post-test Score</td>
<td>22</td>
<td>3.36</td>
<td>1.432</td>
</tr>
<tr>
<td>Online</td>
<td>Pre-test Score</td>
<td>19</td>
<td>3.05</td>
<td>1.649</td>
</tr>
<tr>
<td></td>
<td>Post-test Score</td>
<td>18</td>
<td>3.67</td>
<td>1.085</td>
</tr>
<tr>
<td>Hybrid</td>
<td>Pre-test Score</td>
<td>31</td>
<td>1.55</td>
<td>1.150</td>
</tr>
<tr>
<td></td>
<td>Post-test Score</td>
<td>33</td>
<td>3.33</td>
<td>0.924</td>
</tr>
</tbody>
</table>

Note: N=Number of Subjects; M=Mean; SD=Standard Deviation.
APPENDIX H

STUDENT ATTITUDES TOWARD GROUP ENVIRONMENT SURVEY (SAGE)

This questionnaire includes 56 questions that ask about your attitudes toward cooperative learning in this classroom, as well as, general information about you as a student. Whenever there is a statement about group members, other students, etc., think of the students who have been in your group in this class.

1. The material is more interesting when I work with other students.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

2. I enjoy the material more when I work with other students.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

3. My group members do not care about my feelings.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

4. When I work in a group, my work habits improve.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
5. When I work in a group, I do better quality work.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

6. The work load is usually less when I work with other students.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

7. I let the other students do most of the work.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

8. I feel that working in groups is a waste of time.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

9. My marks improve when I work with other students.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
10. The work takes longer to complete when I work with other students.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

11. The material is easier to understand when I work with other students.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

12. It takes less time to complete the assignment when I work with others.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

13. My group’s members help explain things that I do not understand.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

14. I learn more information when I work with other students.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
15. I become frustrated when my group members do not understand the material.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

16. My work is better organized when I am in a group.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

17. I do not care if my group members get good grades.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

18. When I work in a group, I want to be with my friends.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

19. My group members do not respect my opinion.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
20. My group members make me feel that I am not as smart as they are.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

21. I become friendly with my group members.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

22. When I work in a group, I am able to share my ideas.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

23. I find it hard to express my thoughts, when I work in a group.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

24. My group members like to help me learn the material.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
25. I feel I am part of what is going on in the group.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

26. Our job is not done until everyone has finished the assignment.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

27. My grade depends on how much we all learn.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

28. I learn to work with students who are different from me.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

29. I do not like the students I am assigned to work with.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
30. I get to know my group members well.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

31. When I work in a group, I get the grade I deserve.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

32. When I work in a group, there are opportunities to express my opinions.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

33. We can not complete the assignment unless everyone contributes.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

34. My group members do not like me.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
35. I help my group members with what I am good at.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

36. I have to work with students who are not as smart as I am.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

37. Some group members forget to do the work.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

38. It is important to me that my group gets the work done on time.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

39. I am forced to work with students I do not like.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
40. When I work with other students, we spend too much time talking about other things.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

41. I also learn when I teach the material to my group members.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

42. Everyone’s ideas are needed if we are going to be successful.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

43. I prefer to choose the students I work with.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

44. Do you use your own computer?
   a. Yes
   b. No

45. What is your gender?
   a. Male
   b. Female
46. What is your classification?
   a. Senior
   b. Junior
   c. Sophomore
   d. Freshman

47. Prior to this class, how many distance education courses have you taken?
   a. 0
   b. 1
   c. 2
   d. 3
   e. 4 or more

48. What is your ethnic background?
   a. African American
   b. Asian American
   c. Caucasian
   d. Hispanic
   e. Native American
   f. Other

49. What is your major?
   a. Biology
   b. Other Sciences
   c. Non Science

50. Prior to this class, how many classes have you taken that involved group activities?
   a. 0
   b. 1
   c. 2
   d. 3
   e. 4 or more

51. Which age division best describes you?
   a. 18-25
   b. 26-35
   c. 36-45
   d. 46-55
   e. 56 and above
52. What grade do you expect to receive in the class?
   a. A
   b. B
   c. C
   d. D
   e. F

53. Would you take another class if you knew it involved cooperative learning activities?
   a. Yes
   b. No

54. How do you feel about the use of cooperative learning in this class?

55. Did you enjoy the use group work and cooperative learning in this class? Why or Why not?

56. Do you think the use of group work and cooperative learning helped you understand difficult concepts introduced in this class? Why or Why not?
APPENDIX I

HISTORY OF BIOLOGY PRE-TEST

This questionnaire includes 8 questions that ask about your attitudes toward cooperative learning in the classroom and 5 content based questions.

1. I feel that working in groups is a waste of time.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

2. The material is easier to understand when I work with other students.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

3. When I work in a group, I want to be with my friends.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

4. When I work in a group, I am able to share my ideas.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

5. I find it hard to express my thoughts, when I work in a group.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
6. I feel I am part of what is going on in the group.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

7. I help my group members with what I am good at.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

8. It is important to me that my group gets the work done on time.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

9. The authority for human anatomy throughout most of written history was
   a. Plato
   b. Aristotle
   c. Avicenna
   d. Hildegard of Bingen
   e. Galen of Pergamum

10. William Harvey is remembered for
    a. the discovery of plant vascular tissue.
    b. demonstrating that blood circulates.
    c. his contributions to insects physiology.
    d. being the first to elucidate the scientific method.
    e. His tremendous influence on invertebrate embryology.
11. Among the early theories to explain how information is passed from one generation to the next was the theory of
   a. Reformation.
   b. Preformation.
   c. Formulation.
   d. Emulation.
   e. Distillation.

12. The person credited with popularizing the use of Latin binomials for naming plants and animals is
   a. Louis Pasteur
   b. Jean Baptiste Lamarck.
   c. Georges Cuvier
   d. Carl von Linnaeus
   e. Gregor Mendel

13. The person who proposed the same mechanism for evolution at the same time as Charles Darwin was
   a. Alfred Russel Wallace
   b. Thomas Henry Huxley
   c. Jean Baptiste Lamarck
   d. Gregor Mendel
   e. William Paley
APPENDIX J

PRINCIPLES OF BIOLOGY II PRE-TEST

This questionnaire includes 8 questions that ask about your attitudes toward cooperative learning in the classroom and 5 content based questions.

1. I feel that working in groups is a waste of time.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

2. The material is easier to understand when I work with other students.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

3. When I work in a group, I want to be with my friends.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

4. When I work in a group, I am able to share my ideas.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

5. I find it hard to express my thoughts, when I work in a group.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree
6. I feel I am part of what is going on in the group.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

7. I help my group members with what I am good at.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

8. It is important to me that my group gets the work done on time.
   a. Strongly Disagree
   b. Disagree
   c. Undecided
   d. Agree
   e. Strongly Agree

9. Disease-causing bacteria are called
   a. Pathogens
   b. Cyanobacteria
   c. Archae
   d. Viroids
   e. Protists

10. The largest or most inclusive group listed below is
    a. Class
    b. Phylum
    c. Family
    d. Order
    e. Genus
11. Which best illustrates the movement of energy through the ecosystem?
   a. Food web
   b. Biological magnification
   c. Nutrient cycles
   d. Trophic chain
   e. Krebs cycle

12. A snail is a
   a. Echinoderm
   b. Mollusk
   c. Arthropod
   d. Chordate
   e. Cnidarian

13. Large areas with similar environmental conditions and characteristic plant communities are
   a. Biomes
   b. Climax communities
   c. Biospheres
   d. Ecosystems
   e. Populations
APPENDIX K

INDIVIDUAL ACTIVITY – VUE TUTORIAL

This exercise is designed to familiarize you with VUE software that we shall be using for creating concept maps of the various important aspects of the history of biology. Concept Maps give you a visual image of the relationships among the people and events that shaped biology today.

Your Individual Task

You are asked to copy information from an HTML file to a Visual Understanding Environment (VUE) file to familiarize yourself with using VUE as a prelude to the group assignments that entail construction of concept maps. Begin this assignment by visiting the VUE website (Web Links tab) and installing the software as described in the file UsingVUE.htm.

Conventions for concept maps in this course: The word “concept” will be used to designate people, institutions, or events used in constructing concept maps; the word “aspect” will be used to designate significant aspects associated with each concept. Concept maps you construct throughout this course will follow the pattern of arranging concepts on a concept map template and then discovering (from the course textbook) and adding aspects to them.

Download the SampleConceptMap.vue file from this assignment and open it with VUE software. The file contains a concept map and four boxes with information on molecular genetics. Open the file SampleConceptMapAspects.htm. This file contains four concepts (numbered), associated aspects (lettered), and elucidations of some aspects (lower case
Roman numerals). Your task is to copy concepts two through four and their aspects to the VUE template. (The first concept and aspects have been done for you as examples.) Copy and paste each phrase one at a time. Do not copy the letters or Roman numerals. Note that one of the concepts (Structure of DNA) has aspects with notes (the elucidation of aspects designated by a pencil icon). You can see the notes by placing the mouse cursor over the icon. Right clicking on the icon opens a box for editing or adding notes. You may have to click on a floating menu marked “Info” to open the notes box.

Create a new box by clicking on one of the existing boxes to select it, pressing control C (copy), moving the mouse cursor off the box, and pressing control V (paste). Move the cursor again and paste another copy of the box on your screen. Copy aspects from the open SampleConceptMapAspects.htm file, then double click on text in one of the copied boxes in the VUE program where you want to place the text copied from SampleConceptMapAspects.htm. Press control V to paste the text into the VUE file. Continue until you have copied all the aspects for each concept. Then right click on any aspect that requires a note (Roman lower case in SampleConceptMapAspects.htm). (You may have to click on a floating menu marked “Info” to open the notes box.) Copy the note from the HTML file to the note box of the VUE file. Continue until all the notes are in place. The SampleConceptMapAspects.htm file also contains links to be placed between certain concept boxes. Create a new link box by clicking on the existing box to select it, pressing control C (copy), moving the mouse cursor off the box, and pressing control V (paste). Move the cursor again and paste another copy of
the box on your screen. Four link boxes will be required for this activity. Copy links from the open SampleConceptMapAspects.htm file, then click on text in one of the copied boxes in the VUE program where you want to place the text copied from SampleConceptMapAspects.htm. Press control V to paste the text into the VUE file. Continue until you have copied all of the links provided. The SampleConceptMapAspects.htm file contains a linking line that will be placed between the concepts identified in the file. Copy the linking line using the same procedure as previous described. Drag each line until it is centered between the two concepts to be linked. Stretching the line may be required if the line does not meet both boxes. This is accomplished by clicking on the line with the arrow and dragging each end until it meets the box. Place the appropriate linking box on the line between the identified concepts.

The boxes should be no larger than necessary to accommodate the text within them. Do not expand the box size to extend it over the range of dates. We shall use color coding of boxes for the group exercises, so do not change the colors used here.

Save the completed file SampleConceptMap.vue to your computer. Rename the file with your name and submit it from the Assignment tab. You will see a box near the bottom of the assignment that reads “Add attachments.” This allows you to search your computer for the VUE file you wish to upload. Once the file is attached, click on the “Submit” button.
Grading

You will receive up to one point for each of the concepts (three total) correctly placed in a box. You will receive up to one point for each of the aspects correctly placed (twelve total) and up to one point for correctly placing notes (five total). You will also receive up to one point for each link assembled and correctly placed between the concepts (four total).

Exercises submitted by the due date are graded for up to 24 points. They will be returned for corrections which must be submitted before the final date. Exercises submitted after the due date but before the final date will be graded for half credit and no corrections will be allowed. Exercises must be submitted through the assignment box to receive credit.
Using VUE

Visual Understanding Environment (VUE) software was created under a federal grant to be distributed for free use in academic environments. The software was designed for creating concept maps, but a concept map can be very much like a concept map, hence our use of this software.

Obtaining and installing VUE software. Visit the VUE website listed under Web Links in this course. You should download VUE Windows Installer version 2.2.8 if you are using Windows; download VUE Mac version 2.2.8 if you are using a Macintosh computer. Do not use the beta versions of VUE. Once you have saved the appropriate file to your computer, you should be able to double-click on it and follow the instructions to have the software installed.

Using VUE software. VUE software has capabilities beyond those intended for this course, so you will not need most of the instructions in the VUE user guide. The guide Getting Started in VUE (file GettingStartedVUE2_2_8.pdf) gives you instructions for using the basic features of VUE such as creating links and nodes and moving the nodes around the screen.

Creating notes. You must use phrases or fairly short sentences that capture significant aspects of a given concept and yet fit within the constraints of the concept map. But the brevity of these phrases may lead to ambiguity. You can right click on a phrase to open a menu from which you can select “Notes” and type in whatever explanatory material you need to support the phrase or short sentence. A small pencil icon will appear next to your phrase or sentence to indicate that it is associated with a note. Once a node is created, you can open it to read or edit by
right clicking on the pencil icon.

You have several options for saving a VUE file. You should save your file as VUE file, so that you can edit the file as needed. If you are using a computer on which personal files cannot or should not be stored, such as one of the USM computers, note that you can store files in a personal area created for you within Blackboard (My Files). You will have to save the file temporarily on the computer you are using and then upload it to Blackboard.

You may find advantage in copying the information blocks in your template rather than creating them from scratch. Click to select on whatever you wish to copy, and put it into the clipboard (single click on the template, press control C, move the mouse, press control V) and duplicating it as needed (control V). Then you can edit the copies by double clicking on text to replace it by typing over.
Figure K1. Individual map template.

Figure K2. Completed individual map.
APPENDIX L

ONLINE COOPERATIVE ACTIVITY

Groups of three or four students will be assembled to work collaboratively creating a concept map for particular topics in the history of biology. Names of people, places/institutions, or events, hereafter called ‘concepts,’ that are significantly associated with the development of biological sciences will be supplied by the instructor. Students will be expected to explore information in the course textbook to determine three to four aspects (dependent on group size) for each concept that capture the most important dimensions of the concept with respect to the growth of biological sciences. These aspects will be presented as phrases or sentences associated with the concept. The concept with its aspects will be placed in a concept map using a shareware program called Visual Understanding Environment (VUE). Students in each group will critique the aspects contributed to the project by the other group members. Each student will also create links that show the relationships between pairs of concepts in the concept map. Through this project, students will work together to create a map that illustrates how various concepts are interrelated in the history of biology.
Editing of Concept Maps

*Phase I*

- Begins when concept maps are submitted for editing.
- Students critique other students’ aspects.
- Students also make links between other students’ aspects OR another student’s aspect and their own.

*Phase II*

- Begins when Phase I editing is complete.
- Students respond to critiques by editing their portion of the concept map
- Students critique links made by other students.

Use the concept map file posted in your group bulletin board as a template for your concept map. Please do not change the name of the file. Use the color codes to indicate which of you is principally responsible for supplying aspects and links. If the template is very small on opening, click on “view” “zoom 100%.”

**Your Task**

Members of the group are assigned concepts on the concept map and the responsibility for gathering information about those concepts. At least one member of each group must be responsible for assembling the concepts into the VUE software and submitting the assignment before the due date. A VUE template has been provided that contains the concept map and color codes assigned to the individual members of the group. Group members are expected to gather information for the concepts assigned to them and work collaboratively
with the other members of the group to refine that information, thus maximizing
the group grade. This will be accomplished by critiques done by each group
member on all other group members’ aspects. Each member will then be
responsible for creating three or four links between the concepts of other group
members or between the concepts of other group members and their own
concepts. Ultimately members of the group should decide among themselves
who has been largely responsible for assembling the information for each
concept and apply that group member’s color code to the VUE representation of
the concept on the concept map. A special discussion area has been established
within Blackboard for group members (only) to exchange information they need
to build their concept map. You should use this discussion area to exchange
information and post information that is to go into your concept map. The
discussion area represents a record of what each student contributed in the
event of a dispute. You may find that creating multiple VUE files with parts of the
final file that can be pasted together or passing around a single file is a
convenient way of conveying information among group members. The file you
submit for grading must have its original name, but you will find advantage to
adding dates or member names to the files you post in the bulletin board to
exchange information.

Guidelines for Creating Aspects

Up to one point is awarded for the bulleted phrases or sentences
identifying at least three or four (3 for groups of 3 and 4 for groups of 4) important
aspects associated with each concept. Information for these aspects must come
from the section of the course textbook from which the concept has been assigned. Aspects must come from the appropriate section of the text and cannot be duplicated. You may include more than the required number of aspects, but frivolous aspects will count against the score. Do not copy or paraphrase from the textbook.

- Aspects should recognize the importance of the concept to the growth of biological sciences.
- Citing the content of a book and its relevance to biology is significant. Citing the book title alone is not sufficient.
- Describing interactions and collaborations between or among people is significant. Associating people without specifying what science they did together is insufficient.
- Splitting aspects into closely related components to create additional aspects is not acceptable.
- Be careful to distinguish between aspects that are biologically significant and those that are significant only in social, political, or other contexts. Many aspects are relevant in multiple contexts, but only aspects that are clearly relevant to their concept biologically should appear in the concept map regardless of any other relevant context they carry.

Guideline for Creating Links

Up to one point is awarded for the three or four (3 for groups of 3 and 4 for groups of 4) important links created between concepts. Links must be made between the concepts of other students or between the concepts of another
student and the linker. The link must identify some connection the two concepts possess. Information for these links must come from the section of the course textbook from which the concepts have been assigned. You may include more than the required number of links, but frivolous aspects will count against the score.

- A line must be created that links both concept boxes together.
- A linking box must be placed on the line. The box does not have to be centered if it will overlap another line.
- The box should include the names of both the concepts.
- The box should also include how they are related to one another.
  - For example, a link could say the discovery of genetic code led to sequencing human genome.
  - It includes both concepts being linked, Genetic Code and Human Genome, and how they are linked.

Guidelines for Making Critiques

Critiquing of Aspects

- A critique comprises suggested improvements on aspects of one concept (example below).
- Critiques are graded for up to one point each.
- You may not critique your own material.
- Critique grades are separate from the group grade and awarded on an individual basis.
Critiques must be emailed to the person being critiqued by 9:00 AM on the day Phase I is complete. The email should also be copied to Allison Duckworth and Dr. Curry. You must mark the subject line of your posting “Critique of [group member’s name]” to identify your critique for grading and to alert another group member to respond. Emails not clearly marked as critiques will not be graded.

Critiques must include suggestions for improving or clarifying aspects of the concept map. Examples of critiques include rewording and amplifying an existing aspect, adding notes to clarify an aspect, or proposing a new aspect that is more important to the growth of biology than any already listed. A new aspect could be added to the others or offered as a replacement for an aspect.

Critiques must be of high quality. The major focus must be to improve the concept so that aspects describe the most important contributions to biology. Critiques that only address spelling or grammatical errors are insufficient for critique credit, but they do help improve the group grade.

Each concept and its associated aspects being critiqued must be clearly identified, constructive criticism of each aspect being critiqued must be clearly explained, and each criticism must be supported by a suggested amendment for that aspect.

Students being critiqued are encouraged to respond by editing concept map accordingly. Doing so should increase the group grade for all group members.
Here is an example of a concept with its aspects and a critique of those aspects.

- Sample Concept and Aspects: Anaximander of Miletus (ca 611 - 547 BC)
  - The primary element of the world should be distinct from the other four (earth, air, fire, water).
  - Aperion
  - Creation story posited fire causing the separation of land and water.

- Sample Critique of Anaximander of Miletus:
  - The first aspect is okay. [This comment indicates that no suggestion for improvement is needed. It is included in the critique for completeness with the understanding that no points would be assigned.]
  - Aperion should be identified as the primary element. You might mention that aperion is not well defined.
  - You should add notes to explain the highlights of the creation story.

Here are my suggestions.

- Creatures developed from the separation of elements as a result of the vortex.
- Mud was made of earth and water. Dried by the sun, it gave forth animals.
- Man developed from a fish.
You should consider adding Anaximader’s understanding of cosmogony, since that was a secular statement of creation. Here is my suggestion with notes.

- His cosmogony posited a force driving a vortex that separated the elements according to density.
- Earth was the densest and rested at the bottom.
- Water was on top of the earth.
- Air was on top of water and earth.
- Fire was the lightest. It was on top of the earth and in the sky as the heavenly bodies.

Examples of insufficient critiques:

- “Change the wording of Aspect x.” (You must be more specific and propose proper wording.)
- “Correct the spelling in Aspect y.” (You should point out spelling errors to improve the group grade, but they will not count as part of your critique grade.)
- “Everything looks good.” (This does not suggest improvement, but it can be applied to aspects that are acceptable. You must not choose to evaluate a concept for which you recommend no change for any aspect.)
Critiquing of Links

- A critique comprises suggested changes to improve the links made by another student.
- Critiques of each student (not each link) are graded for up to one point each.
- You may not critique your own material.
- Critique grades are separate from the group grade and awarded on an individual basis.
- Critiques must be emailed to the person being critiqued by 9:00 AM on the day Phase II is complete. The email should also be copied to Allison Duckworth and Dr. Curry. You must mark the subject line of your posting “Critique of [student’s name] links” to identify your critique for grading and to alert another group member to respond. Emails not clearly marked as critiques will not be graded.
- Critiques should make sure each link correctly identifies concepts and how they are related.
- Critiquer should make sure that links can be justified in the text.

Role of the assembler

Each responsibility must be accomplished within 48 hours of the deadline for the preceding component of the assignment. The assembler earns three points extra credit. The assembler must assemble the concepts with aspects into a single map and post on the bulletin board by the deadline in order for the group to start phase I. The assembler must assemble the accepted changes and the
links and post on the bulletin board by the deadline in order for the group to start
phase II. The assembler must assemble the final changes and upload to the
assignment box by the deadline.

Grading Timely and Defaulting Students

Grading the timely student.

- Phase I. Award an individual grade for each review of aspects. Reviews are posted on the bulletin board. Do not grade aspects or links at this time.
- Phase II. Award an individual grade for each review of links. Reviews are posted on the bulletin board.
- Group grade. Grade the final concept map for aspects and links. The student grade is an equal portion of the total group grade.
- Cooperative and group scores will always be as many as 27 points under all scenarios, although the percent of group and cooperative score components varies with each scenario.

Grading the timely student who then defaults in a default scenario.

- A student who has submitted an exercise and then is asked to create more aspects for another concept, may default and lower the group score.
- The group score should be calculated with the total number of points/aspects and links submitted and scaled to the points that should have been submitted to calculate the group score.
- The defaulting student is given the appropriate fair share group score before it is scaled thus reflecting the points missing from the default.
**Grading the defaulting student.**

- A student failing to submit the concept map on time triggers the default scenario and receives a zero for the concept map. (But see below for a student participating in the creation of links.)

- A defaulting student may participate for some credit in phase I by reviewing all the aspects and by creating the appropriate number of links (three in a group of four and four in a group of three).

- A defaulting student creating links should receive a scaled group score for that percent of the score reflected by the total score for links under a given scenario.

- For example, in the four student scenario with one student defaulting and then contributing links, the group score would be based on 54 points, 45 for concepts and 9 for links. The defaulting student would receive 17% (54/9) of the earned group score. A student failing to submit a concept map or failing to participate in phase I may participate for some credit in phase II by reviewing links.

  The concept map file must be submitted by the due date (posted on the bulletin board), reviewed and revised (posted on the bulletin board), and resubmitted by the final deadline (posted to the assignment box). Group submission of the file after the due date but before the final deadline incurs a 10% penalty on the final group grade. Group members will have a few days after the due date to view the completed file and verify that their contribution and that of their colleagues is correct. The computer will not allow any changes beyond
the final deadline for submission. The file must be resubmitted by the deadline even if no revisions were made. Information in the file will be graded and a group grade assigned.

The effort of individual members will be assessed using assigned color codes. Group members making little or no contribution to the group effort as reflected in the number of color-coded entries will have points subtracted from their group score. For example, if four people are responsible for information about 12 concepts, the final effort should include three concepts with associated sets of aspects color-coded for each of the four group members who contributed to the effort.

You should generally use the group bulletin board for communication within the group about concept map assignments rather than email, telephone, etc. The group bulletin board is a record of effort in case of disputes.

**Grading**

*Grading Rubric for groups of three:*

Summary: Students will receive a single grade of up to 27 points in this assignment. It will be composed of a group grade for the completing a concept map and individual grade for critiquing other group members. Each student will create 3 aspects for each of 4 concepts for up to 12 points. Students will also create 4 links for up to 4 points. The total score for all three group members will be 48. Each student will get one third of this score (up to 16 points). This will be the group portion of the grade. Students will also receive an individual grade for their critiques. Each student is expected to critique aspects and links created by
each of the other two group members. Students will be awarded up to 5.5 points for each critique up to 11 points. Points awarded for critiquing will be added to the group score to determine the student’s final grade for this activity.

Assume a group of three students creating aspects for 12 concepts. Each student would create three aspects for each of four concepts for a group total of 36 aspects. Contribution of 12 points per student.

Phase I of cooperative effort. Score for phase I is 12 points.

- Each student reviews all aspects from the other two students.
- Each student creates four links connecting concepts.
  - Students may link their concepts with other students’ concepts.
  - Students may link pairs of concepts created by other students.
  - Students may not link pairs of concepts they created.
  - Student may not create more than one link between any pair of concepts.
- Score 8 points for critique and 4 points for creating 4 links, 12 points total.
  - The critiques represent cooperative points earned individually by each student.
  - The creation of links is added to the group score; 36 points for the aspects plus 12 points for links for a total of 48 points.

One student default scenario

- Each student reviews aspects from the other student and creates two aspects for each of two incomplete concepts.
- Score 4 points for four aspects, 4 points for critiques of aspects from two other group members, and 4 points for creating four links.

- Defaulting student loses points.

- The concept map exercise as submitted is worth 24 points to which are added 8 points for four sets of two aspects and 8 points for links for a total of 40 points. The final product will be missing four aspects and four links compared to the three-student exercise.

**Phase II of cooperative effort. Score for phase II is 3 points.**

- Each student reviews links for each of the other two students. Score is 3 points.

*One student default scenario.*

- Each student critiques links and aspects for the previously incomplete concept from the other students for 3 points.

- Defaulting student loses points.

Total score for three student group is 27 points.

- The group score is up to 48 points divided by three students for up to 16 points.

- The cooperative score, earned individually, is up to 11 points.

*One student default scenario.*

- The group score is up to 40 points divided by two students for up to 20 points. The cooperative score, earned individually, is up to 7 points.
Grading Rubric for groups of four:

Summary: Students will receive a single grade of up to 27 points in this assignment. It will be composed of a group grade for the completing a concept map and individual grade for critiquing other group members. Each student will create 4 aspects for each of 3 concepts for up to 12 points. Students will also create 3 links for up to 3 points. The total score for all four group members will be 60. Each student will get one fourth of this score (up to 15 points). This will be the group portion of the grade. Students will also receive an individual grade for their critiques. Each student is expected to critique aspects and links created by each of the other two group members. Students will be awarded up to 4 points for each critique totaling up to 12 points. Points awarded for critiquing will be added to the group score to determine the student’s final grade for this activity.

Assume four students per group creating aspects for 12 concepts.
Each student would create four aspects for each of three concepts for a group total of 48 aspects. Contribution of 12 points per student.

Phase I of cooperative effort. Score for phase I is 12 points.

- Each student reviews all aspects from the other two students.
- Each student creates four links connecting concepts.
  - Students may link their concepts with other students’ concepts.
  - Students may link pairs of concepts created by other students.
  - Students may not link pairs of concepts they created.
  - Student may not create more than one link between any pair of concepts.
- Score 9 points for critique and 3 points for creating 3 links, 12 points total.
  - The critiques represent cooperative points earned individually by each student.
  - The creation of links is added to the group score; 48 points for the aspects plus 12 points for links for a total of 60 points.

One student default scenario:

- Each student reviews aspects from the other student and creates three aspects one of the three incomplete concepts.
- Score 3 points for three aspects, 6 points for critiques of aspects from two other group members, and 3 points for creating three links.
- Defaulting student loses points.
- The concept map exercise as submitted is worth 36 points to which are added 9 points for three sets of three aspects and 9 points for links for a total of 54 points. The final product will be missing three aspects and three links compared to the four-student exercise.

Phase II of cooperative effort. Score for phase II is 3 points.

- Each student reviews links for each of the other three students. Score is 3 points.

One student default scenario.

- Each student critiques links and aspects for the two previously incomplete concept from the other two students for 3 points.
- Defaulting student loses points.
Total score for three student group is 27 points.

- The group score is up to 60 points divided by four students for up to 15 points.
- The cooperative score, earned individually, is up to 12 points.
- One student default scenario.
  - The group score is up to 54 points divided by four students for up to 18 points. The cooperative score, earned individually, is up to 9 points.

*Figure L1. Group template map.*
Figure L2. Group concept map after Phase I.

Figure L3. Final group concept map.
REFERENCES


