# Cooperative Learning Through In-Class Team Work: An Approach to Classroom Instruction in a Life Cycle Nutrition Course

***L. Suzanne Goodell[1], Natalie K. Cooke[2] and Sarah L. Ash[3,4]***
***North Carolina State University***
***Raleigh, NC***

## Abstract

Aimed at increasing higher level and critical thinking skills, professional and social skill development, and at engaging students in ownership of their learning, Cooperative Learning (CL) occurs when small groups of students work together to achieve a common objective. Through this qualitative examination, student reports revealed three dominant emergent themes related to the CL approach: "Real World" Preparation, Group Dynamics, and Variety Desired. Students wrote that the course described here was challenging and helped prepare them for future careers in which they would be required to work in groups to solve complex problems. In line with the instructor's goals, the CL environment appeared to simulate the challenges associated with group work in a professional setting while providing students feedback on their performance and opportunities to change their behavior in a supportive atmosphere. While student satisfaction was high in the course, they also desired a variety of teaching methods in the classroom (e.g. hands-on activities, guest speakers, whole class discussion), suggesting the CL approach should be paired with additional teaching strategies to optimize learning outcomes. Cooperative Learning could be used in a variety of courses to provide students structured opportunities to learn from each other and to improve their problem-solving abilities.

## Introduction

### Cooperative Learning

As instructors continually seek ways to engage students in their own learning while also leading them to reach higher levels of learning, Cooperative Learning (CL), sometimes referred to as Collaborative Learning, has emerged as a teaching strategy with the potential to do both. CL occurs when small groups of students work together to achieve a common objective (Gilles, 2007). Instructors use CL in a variety of ways, including one-day assignments, whole semester projects, in-class and out-of-class homework, and exams. Likewise, instructors have graded CL work as a group effort, based on individual performance, and through peer- and self-evaluation; others provide no grade at all for CL work (Leman, 2007; McKinney and Graham-Buxton, 1993; Murano and Knight, 1999; Sorensen et al., 1992; Sorensen and Lunde, 1993). Additionally, instructors have incorporated CL into traditional face-to-face, hybrid, and online courses (Doymus, 2008; Lynch, 2010; Sorensen and Lunde, 1993).

Following the social interdependence theory, Johnson and Johnson (1989) purport that successful CL must include five conditions: positive interdependence, individual accountability, promotive interaction, interpersonal skills, and group processing. Positive interdependence is defined as individuals working together to succeed; without all succeeding, none can succeed. Individual accountability occurs when students know that their contribution to the group is necessary for group success and that their individual performance will impact their grade. Promotive interaction is displayed through students working together to teach and learn from each other. Students in a group engaging in promotive interaction work to recognize when others in the group need more information to understand concepts, and they collectively seek to expand their knowledge through additional resources. Interpersonal skills, otherwise known as social skills, can be displayed through the acts of helping everyone in the group learn and get along. Finally, group processing occurs when students,

[1]Assistant Professor of Nutrition
[2]Graduate Teaching and Research Assistant
[3]Professor of Nutrition, Department of Food, Bioprocessing, and Nutrition Sciences; Campus Box 7624
[4]Authors thank Rebecca Henderson, rebecca@rebeccadiann.com, for her technical assistance in the preparation of this manuscript.

as a group, reflect on their performance to determine how to improve for current and future success. When all five of these conditions exist in a group setting, students can work together in a successful CL environment (Johnson et al., 2007).

While some have not found CL to significantly improve academic achievement compared to traditional lecture-based classes (Kromrey and Purdom, 1995), many have reported academic gains related to CL (Bowen, 2000; Felder, 1995; Jaliliafar, 2010; Pray Muir and Tracy, 1999). In addition to academic achievement, CL fosters many different types of student learning and opportunities for student growth, including but not limited to: increasing higher level and critical thinking skills, professional and social skill development, and engaging students in ownership of their learning (Kesler, 1998; Lightner et al., 2007; Murano and Knight, 1999; Shimazoe and Aldrich, 2010; Sorensen et al., 1992).

### Student Teams-Achievement Divisions

Instructors can apply numerous methods to divide students into CL groups, including random selection, self-selection, and Student Teams-Achievement Divisions (STADs). Heterogeneous instructor-assigned groups, like STADs, appear to be more conducive to student learning when no other research question is involved (Felder and Brent, 2001). In STADs, students are purposefully grouped based on previous academic performance to enhance the learning by all group members and to make the groups as comparable as possible (Slavin, 1978). Theoretically, because assignments and performance incentives are based on group outcomes rather than individual work, higher achieving students will help lower achieving students understand the course content. Additionally, by teaching lower achieving students the subject material, higher achieving students will reinforce their own learning and improve their performance as well.

To encourage group work and to discourage one student from completing the assignment for the group on his or her own, those students in STAD groups whose members collectively perform higher than expected on individual exams receive an incentive for their effort. Students who perform well on the exam but whose group members perform poorly do not. Therefore, only those groups whose members as a collective perform exceptionally on individual exams receive the incentive. Example incentives include verbal recognition in front of the class, a special prize, or bonus points on exams. These incentives are meant to motivate the group to work and learn together rather than as individuals. The book Cooperative Learning Methods provides detailed methods for determining grade expectations and exceptional performance as a group (Sharan, 1999).

The purpose of this study was to examine the impact of a Cooperative Learning environment in a life cycle nutrition course on student learning outcomes, including academic, professional, and personal growth. Through this qualitative examination, we explored the advantages and disadvantages of participating in a CL course as perceived by students.

## Methods

### The Course

The class was a junior/senior level 3-credit hour undergraduate course, with the option for enrollment at the graduate level, covering the nutritional needs during each stage of the human life cycle. Table 1 presents the components of student evaluations.

Modifying the procedures outlined by Sharan (1999), the instructor created a hybrid CL course in which lecture material was provided for review outside of class time and group assignments were completed during class time. To provide course content, the instructor used narrated PowerPoint slides to create five to 15 minute audio-recorded lectures. At the start of each unit, students reviewed approximately five to 10 lectures posted on the course website, as well as the assigned book chapters.

Almost every 75-minute class period was devoted to CL, implemented exclusively in the form of case studies. At the beginning of the semester, the instructor led a class discussion on how to complete a case study as a group; students then watched an online lecture on group work, presenting two approaches typically taken by students when completing a case study, along with the advantages and disadvantages of the approaches presented (e.g., the time commitment related to each approach versus quality of group learning and case study outcome). These two approaches included: 1) working together to answer each question (the preferred method) and 2) dividing the questions up among group members and then reviewing each other's work before submission. This lecture was developed based on the instructors' observations of previous groups working together in class. While students were encouraged to

*Table 1. Weighting of Student Evaluation Components*

| Evaluation Component | Percent Contribution to Final Grade |
|---|---|
| 2 Peer Reviews | 10% (5% each) |
| 7 Group Case Studies | 35% (5% each) |
| 3 Exams[z] | 37.5% (12.5% each) |
| 1 Cumulative Final Exam[z] | 17.5% |

[z]Exams included multiple choice, short answer, and case study-based questions.

prepare for their assignment outside of class and work as a group during class time to complete the work, students were allowed to choose their own approach to completing the case study.

Initially, students were divided into twelve STADs of four based on overall grade point average and performance in their introductory human nutrition course (Sharan, 1999). As groups of three to eight are commonly used in CL, the instructor chose teams of four members to promote meaningful interactions between all group members (Johnson et al., 2007). At the halfway point of the semester, the instructor switched to group assignments based on the students' exam averages in the course. This was done so that: 1) group members would provide unrestrained constructive criticism in their peer reviews without fear of retribution; 2) students who received criticism could change their behaviors in the new group environment, providing them an opportunity for a "fresh start"; and 3) all students would be forced to practice their group work skills with new and potentially very different group members.

Out of concern that graduate students might dominate group discussion and silence undergraduate participation, the instructor initially grouped them together. After determining that the undergraduate students appeared confident in their abilities, the instructor inserted the graduate students into the general pool when modifying groups mid-semester.

As part of the group learning process, on the first day of each unit the groups reviewed the assigned case study and its corresponding grading rubric and determined how they would function, including what rules they would follow (Felder and Brent, 2001). These rules included how case studies were completed and deadlines for individual assignments within the group. As indicated earlier, regardless of how the assignment was completed, all group members received the same grade for their group's case study.

Case studies took an average of four class periods to complete and were submitted to the instructor at the end of the last class period for the unit. A general description of question types included in each case study and the corresponding level of learning, using Bloom's Taxonomy (Bloom and Krathwohl, 1956), is presented in Table 2.

*Table 2. Levels of Learning[z] for Each Question Type included in Case Studies*

| Question Type Included in Case Study | Corresponding Level of Learning[z] |
|---|---|
| Fact-based questions related to unit content | Knowledge, Comprehension |
| Assessing nutritional risk using appropriate tools | Application |
| Determining the most important problem areas related to nutritional risk while providing justification for answers | Analysis; Evaluation |
| Articulating and justifying recommendations for change | Synthesis |

[z]Based on Bloom's Taxonomy of Education Objectives (Bloom & Krathwohl, 1956)

The instructor encouraged students to use technology to facilitate group work and assignment completion. In addition to their textbook and lecture notes, students brought their laptops to class and used the Internet to find credible resources to answer case study questions and Google Docs to organize assignments and allow multiple writers to edit materials simultaneously. To discourage ill students from coming to class while encouraging their active participation during class time, groups utilized Google Docs, video conferencing, instant messaging, and texting to communicate with the student from home.

To hold members accountable for their participation in completing the group assignment, students completed peer reviews twice during the semester. Using a seven-point Likert scale, with 1 equal to an extremely poor group member and 7 equal to an excellent group member, students rated each team member based on the following characteristics: arriving to class on time; arriving to class prepared; actively contributing to group work; providing useful, professional, and accurate information; respectfulness; staying on task; active participation in group meetings; and overall quality of the team member. Ratings were then averaged and converted to percentages to determine peer review grade (average rating of 7 equaled 100%). The combination of the two peer reviews was 10% of the final course grade. As a result, students with poor group performance could have lost one letter grade on their final grade. Additionally, groups were given the option to vote out a member, who was then required to complete the case studies on his or her own. (No student was voted out of a group in the semester in which this research took place.) As suggested by Shaman (1999), high achieving STADs received bonus points on their exams.

## Evaluation and Analysis

At the end of the semester, 47 of the 49 students completed a survey about the strengths and weaknesses of the course. Of the class's students, 15 were juniors, 27 were seniors, and seven were graduate students; almost all of the students were either majoring or minoring in Nutrition. Forty-five of the 49 students were female. The survey responses were entered into a Word document, and the instructor and a graduate research assistant independently reviewed and qualitatively analyzed the data through directed content analysis (Hsieh and Shannon, 2005),

determining emergent themes within two broad categories: 1) positive components of the class and 2) things to change within the class. The two researchers then compared their findings and discussed them with a third investigator, coming to a consensus on the major relevant themes within the data. This study was deemed exempt by North Carolina State University's Institutional Review Board.

## Results and Discussion

Analysis of survey data revealed three dominant emergent themes related to the CL approach: "Real World" Preparation, Group Dynamics, and Variety Desired.

### "Real World" Preparation

Students felt their experiences in this CL based course prepared them for working in the "real world." They reported understanding the value of engaging in group work in order to gain skills needed in their future careers. One student wrote, *"Group work is valuable experience needed for the work force; this class provided a great opportunity for group work."* Students also reported an overall appreciation for the class because they enjoyed the CL experience from an academic and professional development standpoint. One student wrote, *"Allowing us to work as a team to complete a goal helps us prepare for our careers later in life. Overall, this is a great course and I have enjoyed it thoroughly."*

While they did not use the terminology of Bloom's Taxonomy, students also recognized and appreciated that the assignments completed as a group helped them achieve higher levels of learning, "put [their] knowledge to practice," and prepare them for the future. One student reported, *"I enjoyed the way that the class was centered around interactive learning in a group atmosphere. The case studies were very stimulating and caused me to really understand concepts and apply them to real world situations. I think this is good preparation for graduate school or on into developing a career [in] nutrition."* One student appeared to be able to identify an intended outcome of CL (to increase student learning and retention) when he/she wrote, *"The class was different than my other courses and retention is at least 80% better. Actually more courses, especially in nutrition, should be structured this way."*

Theorists and instructors often discuss the opportunities inherent in CL for student professional development, including achieving higher levels of learning and fostering interpersonal communication (Lightner et al., 2007; Shimazoe and Aldrich., 2010). To better prepare them for the adversity they will face, students should experience the challenges associated with their profession in the supportive environment of their coursework. This relatively low-stakes approach to professional development found in CL (i.e. the grade is on the line versus the job) can provide students with the skills necessary to help them succeed in the future.

***Table 3. Additional Examples of Student Comments within Each Dominant Themes***

| |
|---|
| **Real World Preparation** |
| "The [assignments] are very helpful because they allow you to solve problems and see what it would be like to have this type of career. Although it wasn't lab-based, the [assignments] made it seem like it was, because you constantly have to work with peers to solve problems." |
| "The ability to work in a group is crucial; this will be more helpful to students than they know!" |
| "The [assignments] are a valuable teaching tool. They force students to understand the material taught in online lectures, rather than just memorize. This uses application of the material for further understanding." |
| "I enjoyed the group work and having the responsibility on us…[The class] also promoted students to work together…The [assignments] were really helpful because it helped students apply their knowledge as opposed to just learning the information." |
| **Group Dynamics** |
| "It helped to view the material and ask my peers for assistance, because we could clear up misunderstandings we each had without the teacher's assistance." |
| "Taught me how to work in groups and coordinate/cooperate outside of class." |
| "Before this class, I always opted to work alone (even in high school my teachers would make exceptions for me on group assignments) but I actually enjoyed working as a group." |
| "At first, I did not like that we did not do any formal note taking or "learning" in the classroom. Once I got into the class and observed the way we learn, I changed my mind. Doing the homework in class with our groups offered time to discuss the chapters and to ask any question we needed." |
| "I liked that we switched groups! Kept me on my toes as far as being a productive team member." |
| "I really liked the group work in this class. I also thought the peer reviews were very nice. I think this makes up for group members who didn't participate like they should have. Overall, I thought this class was challenging." |
| **Variety Desired** |
| "A regroup/recap class every few weeks could help students retain more information." |
| "I would have liked a mini-lecture during class at least once a week. I prefer to listen to a professor sometimes." |
| "The only thing I would change about the course would be possibly allowing one day prior to tests for discussion." |
| "I believe the group discussions as a class were valuable since students have the opportunity to hear other's opinions outside of their group. One class discussion per teaching unit or module would be a great addition to this class to clarify information." |

Students in this course attributed their professional development to working in groups, as well as completing the case study assignments. They wrote about this development generically and listed specific skills they gained as a result of the CL experience. Students discussed higher levels of learning in their writing and demonstrated it in the work presented in their case study assignments. Additionally, students explicitly explained how group work affected their interpersonal communication skills, a construct crucial to CL success. See Table 3 for additional quotes related to each theme.

Furthermore, others have demonstrated that students can both enjoy the CL experience while using higher level thinking (Murano and Knight, 1999). The current study reinforces this notion through student self-report. While students do not always need to like their course work, increased student satisfaction and enjoyment in their classes is associated with increased engagement and student learning outcomes (Carinin et al., 2006).

## Group Dynamics

The CL structure in this course sought to promote the idea of group work in a job-like setting, that is to say, during a set time during class (as during the work day) rather than on their own time. Furthermore, the instructor was able to provide students with feedback and answer questions in "real time," helping to alleviate some of the challenges traditionally faced in group work done outside of class time. However, the course structure still approximated some of the more difficult aspects of group work, including the challenges associated with unequal work ethics among group members.

Students reported several advantages to incorporating CL during the standard class time. One student wrote, *"Group projects can often be hard because of conflicting schedules, so having the opportunity to meet during the class time was a 'stress reliever.'"* Many students also appreciated that CL during class time allowed for peer teaching and group discussion with the immediate availability of the instructor to help resolve conflict. For example, one student wrote:

*"I loved how interactive this class was and how through our peer groups we taught each other. Often times there was a debate, but that just showed us how to back up our reasoning and formulate an agreed upon answer. If in the case we couldn't [agree], [the instructor] was great about slightly pointing us in the right direction while not giving everything away."*

Again, modeling the job-like setting, students also reported that the CL structure forced them to take responsibility for their own learning and that they enjoyed this new requirement. One student wrote:

*"This class really challenged my study skills and time management. I had to seek out the information myself in the book, on the Internet, and in the PowerPoints rather than just passively taking notes during class. I had to take charge of my learning and discipline myself to study/take notes outside of class. This was an 'independent learning class' as opposed to just being spoon-fed material like many of my other classes."*

Through promotive interaction, one of the five main constructs of CL, students teach and learn from each other to increase their group members' understanding of the course content (Johnson and Johnson, 1989). In order to promote group member learning, students must first seek to understand the material themselves. This "independent learning" that students discussed demonstrates the first steps required to engage in promotive learning. Other researchers have also found that students engaged in a variety of CL experiences report taking responsibility for their own learning, as well as the learning of their peers, indicative of promotive interaction (Kesler, 1998; Murano and Knight, 1999; Sorensen et al., 1992).

While students overwhelmingly enjoyed the unique group work experience, many did not like relying on group members to complete assignments because group members did not always complete their assigned work, negatively impacting their grades. One student wrote, *"The weakness of this class was the level of reliability present in peer groups. There were times in the semester where due dates had been established for case study submissions and learning objective assignments, and not everyone would complete their part."* This lack of responsibility resulted in poor group grades, as well as deduction in peer review points for the irresponsible group members. However, the responsible group members did not find this outcome fair.

Again modeling the job-like setting, some students experienced the negative consequences of having poor group members and were forced to decide between making up for their group member's poor performance by spending extra time on a group project to make a good grade or spending time elsewhere and accepting a poor grade. While several chose the former route, others wrote, *"Although I could have looked over their work and edited it, that would have been a lot of work for large case studies,"* and thus chose the latter option.

"Free riders," students who do not do any work or as much work as the rest of their group, are a common problem in CL. Students often worry and complain that their grade will suffer due to the lack of responsibility of other group members and that it is not fair that a "free rider" receives the same grade as the rest of the group (Leham, 2007; McKinney and Graham-Buxton, 1993). Because group success is dependent on individual members contributing ideas and information when they gather together (positive interdependence) and the most successful groups individually prepare for group work outside of their time together (Shimazoe and Aldrich 2010), some suggest implementing a "ticket in" system, wherein students must come to class with notes on the unit of study prior to initiating group work (McKinney and Graham-Buxton, 1993; Rau and Heyl, 1990), while others suggest that instructors give students a pre-test for each unit, to hold individuals accountable for their preparation (Sorensen et al., 1992).

In this case, while the instructor provided a short online lecture related to group work and provided several examples of how to successfully complete case studies as a group, in order to foster a sense of ownership in the CL experience, the instructor allowed the student groups to choose how their groups operated. As is common in CL experiences, some chose to act as a collaborative team, while others acted as individuals in a group thus missing the benefits of the CL experience (Summer and Volet, 2010). Based on student feedback, the instructor plans to provide future students with a more in-depth lesson on CL group work, as well as a group work tip sheet, giving students suggestions on how to overcome common problems encountered in groups (Lightner et al., 2007). Additionally, students will be given a short quiz at the beginning of each unit to increase the likelihood of pre-group preparation. In the future, we plan to explore how instructors can better support students' ability to handle challenging group members and difficult group circumstances in a CL environment.

## Variety Desired

The large majority of students liked the CL environment and felt they gained valuable skills from the course. However, even with their enthusiasm for CL, students expressed a desire for varied learning opportunities, including teacher-led discussions, guest speakers, and service-learning activities. Students wanted to engage in large group discussions with all of their peers, providing them an opportunity to ask questions, hear varying viewpoints and clarify confusing material not addressed in the case studies. One student wrote, *"Although I enjoyed group work and learning in groups, I do not think the whole class should be centered around it. I think it would be beneficial to have at least one teacher-led, in-class lecture per unit, to allow for a better understanding of the concepts."* Additionally, a small group of students (a minor theme in the data) preferred lectures in class and assignments at home, because they felt it better suited their learning style. Others felt that the recorded lectures limited the students' interaction with the instructor and the "experience, knowledge, skills, and feedback [she could] offer."

## Lessons Learned

As in any innovative course, the instructor discovered unexpected advantages to implementing CL in her classroom, as well as elements of her approach she would change the next time the course is taught. Over the next few paragraphs, the authors would like to highlight some of these lessons learned.

While the course was designed to encourage CL, some groups engaged in behaviors that were counter to the key tenants of CL. For example, some groups chose to divide up the questions and assign sections to individual group members, instead of working as a collective on each question. Additionally, assignments were designed such that if the group worked efficiently and effectively, no outside time for assignments would be required. Students were required to attend class until their assignment was submitted. However, because the instructor did not stipulate that students must attend class after their work was completed, on two occasions, a few groups chose to work on the case studies outside of class time, turn their work in early, and use the extra class time for other priorities (e.g. preparing for an exam in another class). In the future, students will be asked to attend class even after their assignment is turned in to encourage group work on learning objectives germane to the individual exams.

As stated earlier, student groups were allowed to choose their own rules for implementing CL. While the course instructor encouraged groups to watch the lectures and read the chapters before coming to class, each group was allowed to determine what course content was to be read by individual members prior to the start of each unit. This flexibility resulted in some students coming to class unprepared, causing them to scramble to familiarize themselves with the course materials during class time, when they should have been spending time on the case study. In the future, students will be required to demonstrate preparedness for class ahead of time through short quizzes at the beginning of each unit.

As presented in the introduction, CL implementation can occur on many levels, including one-time events and/or repeatedly through out the semester. Based on student feedback, future versions of this course will include one lecture or large group discussion at the end of each unit to integrate all that students have learned in that unit. This approach will increase the variety of teaching methodologies within the course to serve those with varying learning styles.

The first time this course was taught in the current format, 29 students were enrolled. The second time, the instructor increased enrollment to 49 due to student demand. While this suggests popularity of the course among students, it also demonstrates the flexibility within the course structure to accommodate a larger class size. In this case, enrollment growth is only limited by the classroom size and the number of groups with which one instructor can interact in the time constraints of a standard 75-minute block. With qualified teaching assistance, this course could easily accommodate over 100 students. Because groups consist of four students each, the number of assignments an instructor must grade in a CL environment is 25% of the non-CL format, thus easing one of the instructor burdens related to larger class size.

### Limitations

Due to the qualitative nature of the data, researchers were unable to analyze data for statistical significance. To confirm the findings of this study, the research team could design and validate a quantitative instrument to measure student perceptions of a CL environment, in addition to measuring student learning outcomes through an experimental design. Furthermore, the student evaluations of the course could be biased by their feelings and attitudes toward the course instructor and thus may not reflect their perceptions of the CL environment if another instructor taught the course. Finally, the study sample is limited to one class section; however, the sample was relatively large (n=47) and representative of students typically enrolled in a life cycle nutrition course.

## Summary

Through this qualitative examination, student reports revealed three dominant emergent themes related to the Cooperative Learning (CL) approach: "Real World" Preparation, Group Dynamics, and Variety Desired. Students reported that the presented course was challenging yet prepared them for future careers in which they would be required to work in groups to solve complex problems. In line with the instructor's goals, the CL environment appeared to simulate the challenges associated with group work in a professional setting while providing students feedback on their performance and opportunities to change their behavior in a group setting. While student satisfaction was high in the CL environment, they desired a variety of teaching methods in the classroom (e.g. hands-on activities, guest speakers, whole class discussion). Cooperative Learning could be used in a variety of courses to provide students structured opportunities to learn from each other and to improve their problem-solving abilities.

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