

Team-based Learning for Agricultural Ethics

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Abstract

We implemented team-based learning in an agricultural ethics course in 2009 and 2010 at a land-grant institution. Team-based learning is a method of interactive instruction where students work in the same team throughout the semester on a variety of tasks such as quizzes, daily activities, and larger projects. Based on a multi-faceted student evaluation process we found team-based learning increased student engagement in the course and facilitated development of teamwork skills. Students reported five principle benefits of team-based learning; 1) respect for multiple perspectives, 2) personal accountability, 3) a willingness to share thoughts and opinions, 4) teamwork skills, and 5) interpersonal skill development. First, we discuss the theory and methodology of team-based learning and offer specifics on our experience. Second, quiz results and student journal excerpts illustrate benefits of team-based learning. We discuss the implications of our results and continuing plans for the course.

Introduction

Today's students are future agricultural professionals whose decisions will affect human and environmental communities. Although it is essential for agricultural students to learn core knowledge, the complex environmental and social problems we face in the 21st century require students to grasp how the application of their knowledge will have ethical consequences. Mascia et al. (2003) noted that social sciences will play a crucial role in helping to stop and reverse human-caused environmental damage. Given agriculture is the largest and most widespread human interaction with the environment, agricultural professionals have a unique responsibility to address the ethical dimensions of their work (Zimdahl, 2000). Agricultural professionals will deal with such pressing issues as poverty, food sovereignty, and how to feed up to twelve billion people with increasingly stressed resources. Therefore, today's students need explicit education in agricultural ethics and opportunities to practice making ethical decisions on issues they will face as professionals.

Collaboration and cooperation will be necessary to tackle the complex problems of the future (Cortese, 2003). Future agricultural professionals will need the skills to make critical decisions within a team. Individuals will benefit from consulting with others

who have a stake in an outcome or a personal or professional opinion. In addition, employers are increasingly seeking workers who have human interaction and problem-solving skills (Fink, 2004). Employees are asked to work effectively in teams and evaluations are conducted at both the individual and team level. Employers report that interpersonal and teamwork skills are becoming increasingly important in agriculture (Graham, 2001). Given this, students need to learn how to work effectively and efficiently as a part of a team. Consequently, traditional lecture-based courses will not adequately equip students to understand and practice applying ethics to agricultural issues or to work as a team.

This article describes our experiences using team-based learning in an undergraduate agricultural and natural resource ethics course at a large land-grant institution. After providing an overview of research on team-based learning, we offer a description of the course. We utilized both quantitative and qualitative methods to evaluate the success of team-based learning in the course. We demonstrate the effectiveness of working in teams by comparing students' individual and team scores on exams. Qualitative methods were used to assess students' reflective journal entries regarding their team experiences.

Team-Based Learning

Team-based learning (TBL) is an empirically grounded instructional strategy that utilizes small groups with the goal of promoting active and effective learning (Michaelsen, 2004). This method promotes active learning so classroom experiences are more interesting and worthwhile (Fink, 2004). However, team-based learning is more than asking student groups to complete a final group project or paper. Teams complete in-class activities and projects where they debate and make decisions on difficult problems. This structure distinguishes team-based learning from mere groups and brings distinct benefits to the classroom including a high level of individual commitment to the welfare of the team and a high level of trust among members of the team.

Effective use of teams has been reported in disciplines as varied as accounting (Lancaster and Strand, 2001), nursing and medicine (Clark et al., 2008; Dunaway, 2005), hospitality and tourism (Wolfe and Gould, 2001), economics (Cohn, 1999),

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and microbial physiology (McInerney and Fink, 2003). A literature search on the terms “team-based learning and ethics,” “team based learning and agriculture” and “team based learning and environmental education” found no articles related to using team-based learning in an agricultural or an agricultural ethics course.

Michaelsen (2004) outlines four principles of team-based learning. First, attention should be given to creating the initial groups. The groups should be formed by the instructor to reduce barriers to cohesiveness (e.g. prior relationships that could cause factions in the group). Michaelsen recommends using any random method to assign groups. Second, individuals must be held accountable for their individual contributions to the team. Third, assignments must serve the dual purpose of increasing both learning and team development. Designing team assignments that demand interaction between team members is critical. “Group papers seldom provide any support for building group cohesiveness and almost universally result in social loafing, or at least what is perceived by others students as social loafing” (Michaelsen and Knight, 2004, p. 59). The team tasks must be structured so that they cannot be divided between team members for individual completion and put together at the end. Fourth, feedback should be both timely and frequent.

Course Overview

The course we taught, Ethics in Agricultural and Natural Resources, was traditionally lecture-based. The course is designed for a junior-level knowledge and includes both agricultural majors and non-majors in other disciplines ranging from Biology to Hospitality, Restaurant, and Tourism Management. To increase participation, interest, content knowledge, and team skills, the instructors implemented team-based learning into the classroom in the fall of 2009 and used it again in 2010. Two instructors co-taught a class of 47 students in 2009 and one instructor taught 45 students in 2010.

The course consists of three units: 1) Deontology and natural resource issues, 2) Utilitarianism and agricultural issues, and 3) Virtue Ethics and climate change. Each unit included individual and team quizzes, daily in-class team activities that required individual pre-class preparation, and a larger team project.

Teams

Michaelsen (2004) recommends creating teams in-class to make the process transparent. Birmingham and McCord (2004) point out that diversity in teams provides members with a broader range of resources and viewpoints. To maximize diversity, students were randomly put into teams of four or five students and remained in their teams for the entire semester. Michaelsen recommends using any random method to assign groups. “It is only when

students work together over time that they become cohesive enough to evolve into self-managed and truly effective learning teams” (Michaelsen, 2004, p. 30). It takes multiple interactions to establish a level of trust and understanding of the resources the team holds collectively to reach higher levels of functioning. As trust grows through stronger interpersonal relationships, communication becomes more effective.

Quizzes

Quizzes occurred at the beginning of each unit to ensure students completed required readings on foundational ethical theories. The purpose of beginning with a quiz prior to discussion or lecture is to ensure students are held accountable for the required readings. Students cannot rely on class lectures to gain necessary knowledge.

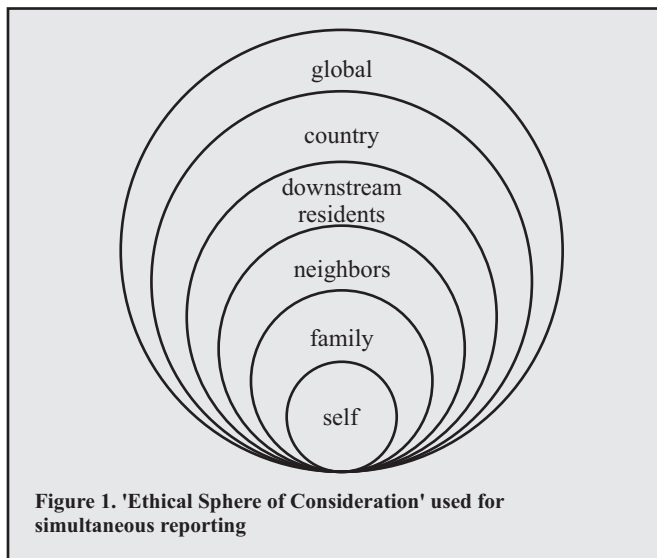
First students complete an individual multiple-choice quiz. While their individual quizzes are being graded in-class by instructors or a Teaching Assistant, teams complete the same quiz together. The team quiz utilizes self-scoring sheets so teams know their progress immediately. Each multiple-choice question has four scratch-off boxes. When a team has decided on their answer, they scratch off one box. A star inside the box indicates a correct answer. Absence of a box means the team should try another answer. Teams scratch off boxes until they find the star. This encourages teams to keep trying and discussing until the correct answer is found.

Team quizzes offer several benefits. For example, the process of reaching a team agreement demands discussion of each teammate's individual answer. In cases where individuals answer differently, each student must defend their reasoning and the team must reach a consensus. One student noted, “I really enjoyed doing the tests individually and then in groups because we could bring our learning together. It also led to discussions, which made the material sink in more.”

Daily Activities with Simultaneous Reporting

The two or three class periods following a quiz focus on activities where teams apply their knowledge to specific agricultural or natural resources situations. Individuals complete pre-class readings and a pre-class assignment on the specific topic. In class, teams debate viewpoints and make an ethical decision on a case study or ethical question. For example, an in-class activity asked each team to decide the appropriate sphere to consider when making ethical agricultural decisions (self, family, immediate neighbors, downstream residents, etc.). After teams had ten minutes to debate and come to an agreement where our ethical sphere should reside, a team representative placed a dot onto a large drawing at the front of the room of expanding ethical spheres to indicate their team's decision (Figure 1). This requires all teams to give their answer simulta-

neously. Teams have to make a decision and stick to it. If all other teams choose “downstream residents” but one team chooses “family,” that unique team cannot change their answer because their answer has already been placed in front of the class. Each team member must be able to defend their choice and ask questions of other teams who may have chosen a different area of the sphere. Last, the instructors facilitated a large class discussion to explore various answers. Simultaneous reporting is beneficial because classroom energy plummets when students are required to listen to other teams' presentations on the same topic. We found students very involved and inquisitive when other teams made a decision different from their own.



Team Projects

The final assessment for each unit was a large team project. Students were given in-class time to work on the project. The project was designed to require teams to increase team decision-making throughout the completion of the project. One plaguing problem with group work is that busy students cannot find a time outside of class to meet. This leads to the divide-and-conquer tactic that does little to contribute to student learning. By providing class time for project work, students were ensured time for teamwork while instructors were available as a resource. Although time on content is sacrificed, as instructors we feel this is a worthwhile trade-off as students utilize class for in-depth team discussions and produce superior thinking, team work, and products. Final projects included creating a professional poster regarding the ethical considerations of a current issue, writing and presenting a dialogue about an agricultural ethical issue, and a professional presentation representing a stakeholder at a climate change conference.

Methods

The University of Nebraska-Lincoln Institutional

Review Board approved the study protocol and all participants provided written informed consent for the authors/instructors to use their journal entries and exam scores in the study. Students in two semesters of the course participated by writing reflection journals on team-based learning (N=92).

First, results of students' individual and team quiz scores were compared. Next, for qualitative analysis, we used open coding to investigate students' journal entries on their team experience. Students completed six online journal entries on various prompted topics throughout the semester. Towards the end of the semester, we asked them to write about their team experience. Students were asked to identify what they liked about team-based learning and what, if anything, they would change about the experience. We also asked them to reflect upon whether or not working in a team aided their classroom experience and their learning.

Although researchers have discussed benefits of team learning scholarly texts, we had no pre-developed themes in mind while reading student entries. Both instructors read each student's entry. Main statements were gleaned and written in the margins of the entry. Next, similar topics were grouped into categories to create themes. After themes were created, journals were re-read and remarks that illustrated each theme were tallied and representative comments were selected for inclusion.

Results

Over two semesters, 92 students each took three quizzes, for a total of 276 quizzes. Student teams took the same quiz immediately following the individual quiz. In all but three instances, student teams outperformed even the highest scoring individual of the team. Student teams scored an average four points higher than individual students. The maximum increase of a team score above an individual's score was 11.75 points and in only one incident, a student's team scored two points worse than the individual. Table 1 shows an example of team individual and team scores for the three quizzes.

Scores alone cannot illustrate the benefits of team quizzes. Teams take the same quiz immediately after individuals, and as this is the second round of the quiz, we can assume that teams will score better. Although students often cite increased scores as the primary benefit of team quizzes, as instructors we see many positive aspects that deepen students' learning. The benefit comes in the discussions between team members. Students learn to justify and explain their individual choice if there are differences among team members, choices are negotiated, and teams must make a consensus decision before scratching off an answer.

The most important feedback on the benefits of team-based learning came from students' personal journals on their team learning experience. Five themes emerged detailing the principle benefits of

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team-based learning as experienced by our students: 1) respect for multiple perspectives, 2) personal accountability, 3) a willingness to share thoughts and opinions in their team, 4) teamwork skill development, and 5) interpersonal skill development. Each theme is described below with examples from student journals. The responses were overwhelmingly positive, though students did express challenges they faced in their teams. Both positive comments and constructive criticisms are included to add validity to the results.

Table 1. Sample Team Quiz Scores

Student	Quiz 1 Individual	Quiz 1 Team	Difference	Quiz 2 Individual	Quiz 2 Team	Difference	Quiz 3 Individual	Quiz 3 Team	Difference
1	13.3	15.0	1.8	9.5	14.3	4.8	8.0	14.6	6.6
2	8.0	15.0	7.0	11.5	14.3	2.8	10.0	14.6	4.6
3	14.0	15.0	1.0	14.0	14.3	0.3	11.0	14.6	3.6
4	13.8	15.0	1.3	10.5	14.3	3.8	8.5	14.6	6.1
5	9.3	15.0	5.8	9.5	14.3	4.8	10.0	14.6	4.6

Multiple Perspectives

The benefit of listening to, and working to understand, divergent perspectives was the most mentioned benefit of team-based learning (Table 2). When engaged in an ethical debate, people inevitably have different opinions. Through working in teams, students learned to value diverse opinions. "I was introduced to new ways of looking at things through my teammates." Students had to consider agricultural and natural resource issues from many stakeholder perspectives and through the lens of different ethical theories. Students also had to consider the viewpoints of their teammates. "Team-based learning forces people to see others' opinions."

Students made the connection between the challenge of working with different perspectives in their teams and the divergent perspectives stake-

holders have on solving environmental issues. "Some of the challenges were that working as a team; it was hard to come to one conclusion when everyone felt differently. This was a big challenge, but it was also beneficial in the end because this is what the work world is like." Because this course was based on student teams making decisions on ethical issues, each student had opportunities daily to express their opinion. Students had to practice dealing with multiple perspectives and not just their own opinion or the views of the instructor(s).

Personal Accountability

Although instructors would like to believe every student gives their best effort in a class, which is not always the case. For various reasons, students fail to complete readings, study effectively for exams, and put forth less effort than expected. Team-based learning uses peer accountability to increase student involvement in the course since students may be comfortable letting themselves down. They may be comfortable not living up to instructor expectations. However, we have learned that is more difficult for many students to let team members down. Students reported studying harder, attending class more often, and taking their learning more seriously simply because of team-based learning. "When we would take tests, I would make sure that I had read the articles maybe a little more closely than I would have normally because I would not want my unpreparedness to affect the team as a whole." Students realize they are not learning only for themselves, but for their team as well. Students were more engaged and our classes had almost 100% attendance each day. "Not only are you trying to do a good job for yourself, there are three others that are depending on you as well which I believe brings out the best in someone." Team-based learning encourages active and consistent student attendance and participation. "My team motivated me to go to class prepared every day and to always strive to do my best work. The thought that others were depending on me motivated me more than any other class ever has."

Table 2. Number of Theme Comments and Examples (N=92)

Theme	Times mentioned	Example
Multiple perspectives	70	"No one thinks alike so it really opens you up to new ideas."
Personal accountability	23	"I have an obligation to my team to be there every class, it gives me initiative."
Sharing	50	"I'm the kind of person that doesn't like to speak in front of the class but it was easy for me to talk to members of my group."
Teamwork skills	24	"I have learned how to cooperate and work with people who have different ideas from me."
Interpersonal skills	22	This helped me learn when to speak up and when to just listen even if I don't agree.

Willingness to Share

Every class contains outspoken students and those who do not feel comfortable contributing to class discussions. Shy students therefore miss an experience to deepen their understanding through active debate. Team-based learning provides a mechanism for all students to feel comfortable sharing their ideas and opinions. One purpose of keeping students in the same team for the entire semester is that it allows relationships to form between team members. Teams that develop trust have discussions that include all members. It is much easier for some students to talk to three other people than it is to express their opinion to 50 other people. "I'm the kind of person that doesn't like to speak in front of the class but it was easy for me to talk to members of my group." Especially in courses that require debate and thinking through difficult issues, team-based learning allows active participation by all students.

Teamwork

Employers value teamwork skills. A recent study by the Association of American Colleges and Universities found that 71% of employers cited teamwork skills as a necessary outcome of higher education (AACU 2010). However, most group work requires students to meet outside of class. These groups usually do not work together throughout the semester or during class time. This leads to some students carrying the workload for the others. "Usually when working with teams before I was the ring leader and in some of the cases if it hadn't been for me the team would have taken a failing grade." Many students are initially skeptical when we tell them that teams can accomplish more than individuals can. Throughout the semester, students in our course experienced the positive results that a team can produce. "Having everyone do their part and bring different things to the table really made the projects and efforts better as a whole."

Students reported learning teamwork skills they plan to transfer to their careers. "I've never considered myself a good team player until this class because this class showed me what an amazing experience you can have working through problems with other people." Some groups did experience challenges. Instructors who utilize team-based learning expect team members to have difficulties. This is an important part of the learning experience. Although students find dealing with difficult team members very frustrating, it is essential they realize that classroom experience can transfer to their future workplace.

Dealing with conflict management becomes more important when utilizing team-based learning. Knowing when to intervene and when to let students work out problems on their own takes patience and practice. If team difficulties do not go beyond simple frustration at difference of opinion, personalities, or

work styles we do not intervene unless asked. We also remind students that effectively dealing with conflict will be an essential workplace skill and that the classroom is a safe place to practice such skills.

Interpersonal Skills

Working closely with team members helps students develop interpersonal skills. In a large class, students can easily tune out discussions. With team-based learning, students have to listen to team members. "I also believe it made me a better listener and helped me value others opinions more." Ethics poses difficult problems and many students have strong feelings. The strong emotions students feel can hinder their ability to think critically about an issue (Hofreiter et al., 2007), but listening to teammates helped students remain open to different opinions. "I feel that our group also dealt with disagreements very well. We listened to each other's ideas and compromised."

Daily activities ask teams to make a decision on an agricultural or natural resource issue. Students experienced the difficulty of reconciling differences of opinion. "The teams were challenging because it was hard to listen to the views of every team member when you disagree on something. This helped me learn when to speak up and when to just listen even if I don't agree." Because students remained in the same teams through the semester, strong bonds were formed. "We respected each person and developed relationships and also had residual trust that turned to resilient trust in the end."

Discussion

Team-based learning requires students and instructors to think about, and participate in, learning in a new way. Instructors using team-based learning structure their entire class around this method, which can be a departure from 'the ordinary.' Students have to be willing to step outside of their comfort zone and actively participate with their teams every class period. However, despite the learning curve for implementing and effectively using team-based learning, we could not recommend it more highly. Most of our students take the agricultural ethics class to fulfill a requirement. Yet many leave satisfied that they learned the content while gaining valuable life and professional skills, as well as a few new friends.

It is important to remember that great teams and teamwork does not 'just happen.' Carefully facilitating the team-based structure is essential for students to move beyond past negative experiences and embrace the benefits of working in a team. "I usually do not like doing team projects, but this class has made it easy to be able to work with each other. This is the best team learning class I have taken because of how close it has made our team by having us work together and learn from each other."

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Students expressed in their reflection journals that team-based learning prepares them for the difficult tasks they will face as future agriculture professionals. Farmers, crop scouts, extension agents, and agricultural teachers will all need the ability to work in teams and make difficult ethical decisions. Students who have had the opportunity to practice teamwork skills will be better equipped for the complex environmental and human problems of this century.

Summary

Team based learning can be a benefit to any classroom, but especially to courses such as ethics where debate and sharing of ideas is essential to the process as well as the content. Students reported learning the content in more depth than if the class was lecture based. In addition, students learned valuable lessons in teamwork and interpersonal skills that will stay with them long after they have forgotten specifics of course content. We hope that our students learn to listen and respectfully converse with people who have a different opinion or come from a different background. Students in two classes of Ethics in Agriculture and Natural Resources reported five key benefits of team-based learning: respect for multiple perspectives, personal accountability, a willingness to share thoughts and opinions, teamwork skills, and interpersonal skill development. Each benefit was discussed above with examples from students. Increased quiz scores demonstrate the benefit of teamwork on students' grades. Given the positive responses from students' personal reflections and their increased exam scores, we feel that team-based learning facilitated classroom success.

Literature Cited

The Association of American Colleges and the wake of the economic downturn. http://www.aacu.org/leap/documents/2009_EmployerSurvey.pdf.

Birmingham, C. and M. McCord. 2004. Group process research: Implications for using learning groups. In: Michaelsen, L., A.B. Knight, and D. Fink (eds.). *Team-based learning: A transformative use of small group in college teaching*. Sterling, VA: Stylus.

Clark, M.C., H.T. Nguyen, C. Bray, and R.E. Levine. 2008. Team-based learning in an undergraduate nursing course. *Jour. of Nursing Education* 47(3): 111-117.

Cohn, C.L. 1999. Cooperative learning in a macroeconomics course: A team simulation. *College Teaching* 47(2): 51-54.

Cortese, A. 2003. The critical role of higher education in creating a sustainable future. *Planning for Higher Education* 31(3): 15-22.

Dunaway, G.A. 2005. Adaption of team learning to an introductory graduate pharmacology course. *Teaching and Learning in Medicine* 17: 56-62.

Fink, D.L. 2004. Beyond small groups: Harnessing the extraordinary power of learning teams. In: Michaelsen, L., A.B. Knight, and D. Fink (eds.). *Team-based learning: A transformative use of small group in college teaching*. Sterling, VA: Stylus.

Graham, D.L. 2001. Employer perception of the preparation of agricultural and extension education graduates. *Jour. of Southern Agricultural Education Research* 51(1): 88-101.

Hofreiter, T.D., M.C. Monroe, and T.V. Stein. 2007. Teaching and evaluating critical thinking in an environmental context. *Applied Environmental Education and Communication* 6: 149-157.

Lancaster, K.A. and C.A. Strand. 2001. Using the team-learning model in a managerial accounting class: An experiment in cooperative learning. *Issues in Accounting Education* 16(4): 549-567.

Mascia, M.B., J.P. Brosius, T.A. Dobson, B.C. Forbes, L. Horowitz, M.A. McKean, and N.J. Turner. 2003. Conservation and the social sciences. *Conservation Biology* 17(3): 649.

McInerney, M.J. and L.D. Fink. 2003. Team-based learning enhances long-term retention and critical thinking in an undergraduate microbial physiology course. *Microbiology Education* 4: 3-12.

Michaelsen, L.K. 2004. Getting started with team-based learning. In: Michaelsen, L., A.B. Knight, and D. Fink (eds.). *Team-based learning: A transformative use of small group in college teaching*. Sterling, VA: Stylus.

Michaelsen, L.K., and A.B. Knight. 2004. Creating effective assignments: A key component of team-based learning. In: Michaelsen, L., A.B. Knight, and D. Fink (eds.). *Team-based learning: A transformative use of small group in college teaching*. Sterling, VA: Stylus.

Wolfe, K. and R. Gould. 2001. Insights on team-based learning. *Jour. of Hospitality and Tourism Education* 13(3/4): 87-96.

Zimdahl, R.L. 2000. Teaching agricultural ethics. *Jour. of Agricultural and Environmental Ethics* 13(3): 229-247.