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Student Perceptions Concerning their Experience in a Flipped Undergraduate Capstone Course

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Abstract

Flipped learning is an innovative approach to teaching at the post-secondary level. Traditional methods of initial delivery of curricular content occur before a face-to-face class session. Students must prepare before attending class, as the majority of face-to-face class sessions are utilized for applying curricular content to complex problems. A specific application of flipped learning, Team-Based Learning holds students accountable for the pre-class preparation via an individual test, as well as to their peers via a team test. Students engage and discuss curricular content on the team test as well as application exercises, which are rigorously designed activities aimed at increasing cognitive skills of the students. This study sought to determine student's perceptions of a recently adopted, atypical teaching approach, known as Team-Based Learning in the Iowa State University capstone farm management course (AgEdS 450). Post-course quantitative and qualitative data were collected. Overall student perceptions were positive and supported the adoption of a student-centered course design. It is recommended that dedicated training workshops be developed for faculty members within Colleges of Agriculture that focus on student-centered instruction. Further examination of Team-Based Learning in other courses within Colleges of Agriculture, and Agricultural Education courses specifically, is recommended.

Keywords: team-based learning; flipped learning; active learning; capstone course

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Introduction

In today's rapidly changing world, students must possess "requisite skills for lasting success" (Rateau, Kaufman, & Cletzer, 2015, p. 52) as they enter the workforce. Such skills garnering attention within the literature include; communication skills, working in teams, problem-solving abilities, and critical thinking skills (Casner-Lotto, Barrington, & Wright, 2006; Crunkilton, Cepica, & Fluker, 1997; Currey, Oldland, Considine, Glanville, & Story, 2015; Espey, 2010; Hazel, Heberle, McEwen, & Adams, 2013; Perry, Paulsen, & Retallick, 2015; Perry, Retallick & Paulsen, 2014). Active learning has been documented as having a positive effect on the aforementioned skills (Currey et al., 2015; Duron, Limbach, & Waugh, 2006; Popil, 2011; Prince, 2004; Tsui, 2002; Yang, 2012; Youngblood & Beitz, 2001).

Flipped instruction is one example of an active learning technique that can be employed in a variety of learning environments (Prince, 2004; Roehl, Reddy, & Shannon, 2013) and has been adopted in many courses throughout higher education (Barkley, 2015; Gilboy, Heinerichs, & Pazzaglia, 2015; Horn; 2013). In a flipped learning environment, traditional content delivery methods (lectures, presentations, and readings) are *flipped* to occur prior to the face-to-face setting, allowing additional time to be devoted to applying course concepts towards difficult problems

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(Mason, Shuman, & Cook, 2013; Michaelsen, Knight, & Fink, 2004; Rosenberg, 2013; Tucker, 2012). The Flipped Learning Network (FLN) (2014) suggests that the face-to-face component of student learning should be "transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter" (p. 1). Supporters of this teaching method postulate higher student engagement, improved performance, and increased motivation (Gilboy et al., 2015; Tucker, 2012).

Ideological acceptance of and advancements in technology have provided a natural segue into improved restructuring course delivery methods within institutions of higher education (Conner et al., 2014a; Kim, Kim, Khera, & Getman, 2014). Teaching approaches that can embed the acquisition of the aforementioned skills have a greater chance of being viewed positively by students as well as employers (Currey et al., 2015). If the desired skills (i.e., critical thinking, teamwork, problem solving) are not already embedded within the course structure, instructors may need to consider major course revisions.

Even with the rising popularity of the flipped approach (Stevenson & Harris, 2014), lecture dominates the landscape of higher education teaching (Conti, 2004). Balschweid, Knobloch, and Hains (2014) found that faculty members (n = 7) engaged in teaching contextualized courses in agriculture (i.e., animal science, food science, and plant science) at two land-grant universities, had no formal training in the teaching process and the majority of instruction that occurred in their courses was teacher-centered (i.e., lecture). Balschweid et al. (2014) suggested "emphasis on faculty development in the understanding and use of learner-centered teaching strategies is needed" (p. 173).

Many studies concerning the flipped classroom and its benefits can be found throughout the educational literature; such instances include flipped learning in nursing education (Bristol, 2014), pharmacy education (See & Conry, 2014), information technology (Kong, 2014), engineering education (Mason et al., 2013), and many other areas (O'Flaherty, Phillips, Karanicolas, Snelling, & Winning, 2015). The popularity of this pedagogical practice within Colleges of Agriculture is seemingly growing as it is the focus of several recent studies (Barkley, 2015; Conner et al., 2014a; Conner, Stripling, Blythe, Roberts, & Stedman, 2014b; Gardner, 2012).

Discrepancies exist as to where or when flipped learning originated. For its acceptance in the secondary setting, some concede the idea stemmed from Colorado based chemistry teachers Johnathan Bergman and Aaron Sams in 2008 (Tucker, 2012). Conner et al. (2014b) postulated the flipped model was introduced into higher education by Baker in 2000. Many others credit the flipped model to Salman Khan, the founder of the Khan Academy which officially began in 2006 (Adams, 2014). It is important to note that the development of OpenCourseWare (OCW) by the Massachusetts Institute of Technology (MIT) (MIT, 2002) was the driving inspiration for Khan and has led to the creation of many similar programs (e.g., Udacity, Coursera, and EdX) (Bishop & Verleger, 2013). These websites demonstrate an increasing ideological acceptance of technology usage within the learning environment (Bishop & Verleger, 2013; Conner et al., 2014a) that can aid in flipping classrooms around the world.

While technology has made flipped learning easier to adopt (Martin, 2012), the idea of requiring students to study the introductory material before attending class and spending face-to-face time applying the concepts to real-world problems was being utilized in the late 1970's by Dr. Larry Michaelsen (Sibley, 2015; Sibley & Ostafichuk, 2014). Michaelsen called his method Team Based Learning (TBL). Defined as a teaching method which integrates a flipped approach and relies heavily on the use of small groups with the purpose of transforming them into high performance learning teams (Michaelsen et al., 2004), Neider, Parmalee, Stolfi, and Hudes (2005) posited that TBL is an active learning process that aids students in acquiring factual materials as well as in developing higher-level cognitive skills. The aforementioned benefits of TBL are

initiated by implementing strategies to ensure student accountability for content delivered in a flipped scenario. The five step Readiness Assurance Process (RAP) is integrated within TBL and includes: pre-class preparation, individual assessment, team assessment, an appeals process, and oral feedback (Michaelsen, Sweet, & Parmalee, 2011). Pre-class preparation includes viewing online lectures or presentations and reading reference materials prior to participating in the face-to-face class setting. Once students arrive to the face-to-face meeting, they are assessed individually over the pre-class curricular content. After submission of the individual assessment, students complete the assessment again, but in teams. Michaelsen et al. (2004) observed robust student conversation during implementation of the team test which served as a natural segue into application exercises where students apply the newly acquired content toward complex, real-world problems or situations. Figure 1 displays the sequence of activities within a TBL formatted course.

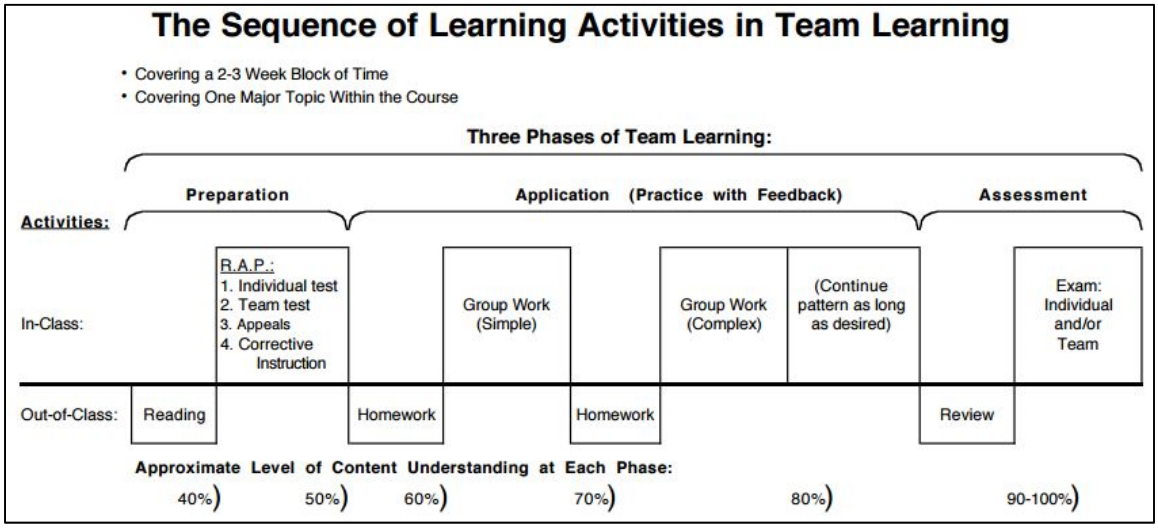

Figure 1. The Sequence of Learning Activities in Team-Based Learning. Reprinted from *Team-based learning: A transformative use of small groups* (p. 13) by L. K. Michaelsen, A. B. Knight, L. D. Fink, 2004, Sterling, VA: Stylus Publishing. Copyright 2004 by Stylus Publishing. Reprinted with permission.

Setting

Agricultural Education and Studies 450 (AgEdS 450) at Iowa State University has provided students with a capstone experience in the management and operation of a real, working farm since 1943 (Murray, 1945). The tenets of a capstone course as outlined by Crunkilton et al. (1997) are followed and include an emphasis on teamwork, communication, decision-making, problem-solving, and critical thinking. Students are tasked with making decisions relevant to a working farm (i.e., seed selection, fertilizer plans, and building and safety audits) (Paulsen, 2010). In order to meet the needs of a diverse student population and further attempts to promote active learning, TBL was implemented into AgEdS 450 in the fall of 2014.

Teams were determined on the first day of the semester and were comprised of five to seven students. The teams were created by administering a questionnaire that separated students by experience, with the goal of creating heterogeneous student groups. Teams completed team tests, course assignments, and application exercises together. After the teams had been decided, students were assigned to one of six committees (i.e., finance and marketing, customs and swine, public relations, buildings and grounds, machinery, and crops), allowing team representation for each enterprise associated with the management and operation of the farm enterprise (Paulsen, 2010).

Teams make all decisions relevant to the farm and committees carry out the decisions made. For example, collectively, the teams may decide to purchase a piece of equipment from a local dealer. The machinery committee would then be responsible for the actual acquisition of said equipment. This process ensured a group of students were responsible for carrying out decisions that were made.

Theoretical and Conceptual Framework

Mezirow's transformative learning theory served as the theoretical framework for this study. Transformative learning theory is defined as "the process of effecting change in a frame of reference" (Mezirow, 1997, p. 5). Mezirow (1997) stated that for learning to be meaningful, new information acquired by learners should be incorporated into "an already well-developed symbolic frame of reference, an active process involving thought, feelings, and disposition" (p. 10). Learners draw from and build upon previous experiences in a transformative learning experience. In order to foster learner self-direction, the educator becomes the facilitator and emphasizes problem-solving groups in which students learn from one another (Mezirow, 1997, 2000).

The Taxonomy of Learning Activities (TLA) (Roberts, Stripling, & Estepp, 2010), as shown in Figure 2, served as the conceptual framework for this study.

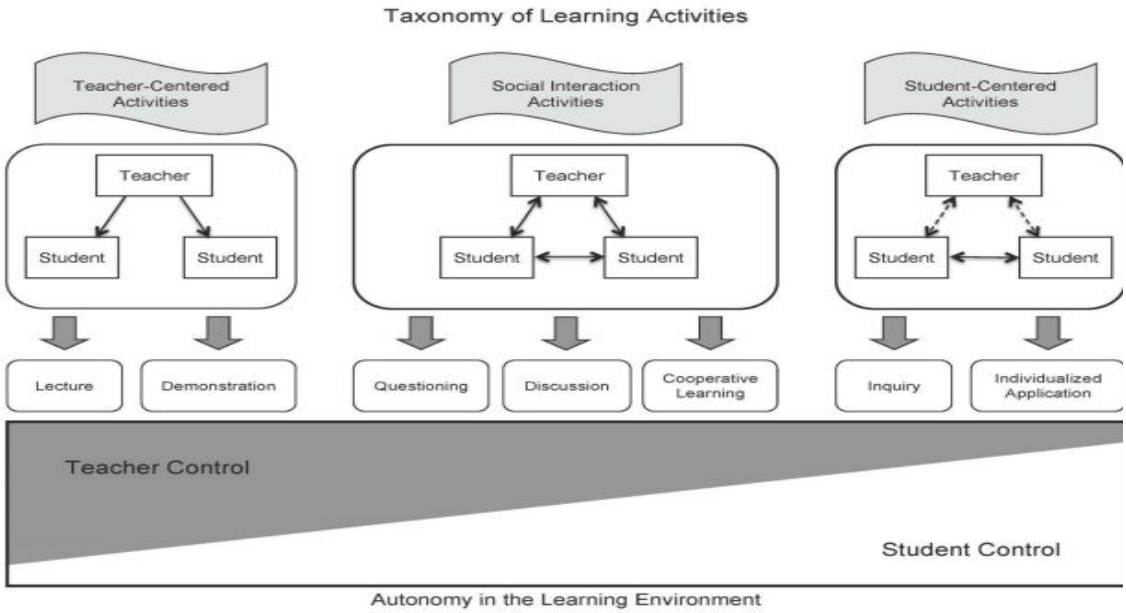

Figure 2. Taxonomy of Learning Activities Model (Roberts, Stripling, & Estepp, 2010)

The TLA was developed to enable instructors to conceptualize the relationships along a continuum of three primary categories of learning activities. Starting from the left of the TLA model, teacher-centered activities use a high degree of teacher control and were defined as lectures and demonstrations provided by the instructor. Teacher-centered activities severely limit student social interaction. Moving along the model, one is transitioned into adopting more social interaction activities. Social interaction activities are then defined as including reciprocal teaching between and among teachers and students. This category of learning activities contains "…substantial amounts of teacher-learner, learner-teacher, and learner-learner interactions" (p. 71). Social interaction activities include questioning and discussions within the learning environment. The final category of TLA, student-centered activities, utilize inquiry and individual applications. This

category provides opportunities for students to learn from experiences. The bottommost portion of the TLA shows the continuum regarding the regulation of learning. Development across the model builds from teacher-centered activities to more student-centered activities; the student becomes more responsible for the regulation of learning.

In the flipped classroom, teacher-centered activities are shifted to online formats consisting of video lectures or other forms of media (newsletters, magazine articles, research articles) that introduce students to the content before attending a face-to-face class session (Conner et al., 2014a; Conner et al., 2014b; Michaelsen et al., 2004). "…this allows for more of the social and student-centered activities to occur during class time" (Conner et al., 2014b, p. 69) when students may struggle to apply to the content to real-world problems (Bergman & Sams, 2012).

In this study, we conceptualized TLA (Roberts et al., 2010) within TBL activities. TBL utilizes each component in the TLA continuum. TBL activities begin with teacher-centered activities and finish in the student-centered activities category. Table 1 displays the category of teaching activity and the specific teaching activity associated with it, and corresponding activities that are found within the sequence of TBL activities.

Table 1

Parallels between the Taxonomy of Learning Activities and TBL Activities

TLA (Roberts et al., 2010)	TBL Activity
Teacher-Centered Activities	Preparation
Lecture	Out-of-class reading (or video)
Demonstration	Out-of-class reading (or video)
Social Interaction Activities	Preparation/ Application
Questioning	Individual and team tests
Discussion	Corrective instruction, application activities
Cooperative Learning	Team tests, appeals, application activities
Student-Centered Activities	Application/ Assessment
Inquiry	Individual application exercises, review
Individual Application	Individual application exercises, individual exam/ project

Purpose and Objectives

Examining the flipped approach to teaching should be measured in various contexts within agriculture in order to assess its efficacy (Conner et al., 2014b) and its effect on learning (Roach, 2014). These proclamations (and akin sentiments throughout the literature), coupled with priority area number four of the National Research Agenda: Meaningful Engaged Learning in All Environments (Doerfert, 2011), provides a foundation for this study. In order to assess student satisfaction of the flipped AgEdS 450 course at ISU, which strives to provide a setting where students "will be actively and emotionally engaged in learning, leading to high levels of achievement, life and career readiness, and professional success" (Doerfert, p. 21), the purpose of this study was to examine student perceptions of the effectiveness of TBL.

The following objectives were identified to fulfill the purpose of this study.

1. Describe how TBL influences students' motivation to learn.
2. Describe how TBL practices influence students' skills related to critical thinking.
3. Describe student attitudes and beliefs about learning in a TBL formatted course.
4. Determine student perceptions regarding the enhancement of TBL learning.

Methods

We utilized a descriptive survey research design to identify student perceptions of a flipped approach to AgEdS 450. AgEdS 450 at ISU underwent a major structural revision for the fall 2014 semester. In an effort to gauge if this course revision was valued by students, their perceptions of TBL in a capstone course were sought. The research design for this study utilized the elements of the tailored design method (Dillman, Smyth, & Christian, 2009). The purposively selected target population included all students enrolled in AgEdS 450 during the fall 2014 semester. Of the 57 students enrolled, 48 completed the survey instrument for an 84.2% response rate. Non-response error was addressed by comparing respondents and non-respondents personal and demographic data to known population data (Miller & Smith, 1983). No significant differences were found.

An electronic questionnaire developed by Bickelhaupt and Dorius (n.d.) was utilized to measure student perceptions of the flipped course. Content and face validity were established by a panel of experts in survey design and TBL methodologies. The instrument was tested with students (n = 1039) in TBL formatted courses at ISU to measure reliability. Following the suggestions of Urdan (2012), the construct reliability coefficients were deemed acceptable ($\alpha = 0.84 – 0.92$), and thus used in the present study. Urdan (2012) suggested that a Cronbach's alpha of .70 or higher is considered acceptable. The instrument consisted of five major sections and was guided by three constructs which included: 1) student beliefs and attitudes about learning, 2) student motivation to learn, and 3) professional development through critical thinking (e.g., student perceptions of their development of specific critical thinking activities). The student beliefs and attitudes about the learning construct was comprised of questions relating to individual learning, group learning, and self-efficacy regarding the learning process embedded in TBL practices. Section one used a five point Likert-type scale (1 = "not at all true of me", 2 = "sometimes", 3 = "neutral", 4 = "mostly", to 5 = "very true of me"), while sections two and three utilized a slightly different five point Likert-type scale (1 = "strongly disagree", 2 = "disagree", 3 = "neutral", 4 = "agree", to 5 = "strongly agree") to measure responses. Section four included two open-ended questions for qualitative feedback on the course structure (e.g., *what if anything would have enhanced your Team-Based Learning experience during this course?*). Dillman et al. (2009) found that respondents are more likely to complete a survey when demographics are not at the beginning, therefore the fifth and final section included four demographic questions requesting age, transfer status, grade point average (GPA), and gender.

Quantitative data were entered and analyzed using SPSS version 19.0 (IBM). Measures of central tendency (mean) and variability statistics (standard deviation) were calculated to interpret students' perceptions of their experience in the TBL formatted AgEdS 450 course. Reliability coefficients for all three constructs for the present study were deemed acceptable or higher (Urdan, 2012). The *Motivation to Learn* construct was rated acceptable (α = .728), the *Professional Development through Critical Thinking* construct was deemed good (α = .837), and the *Beliefs and Attitudes about Learning* construct was deemed excellent (α = .913).

To satisfy objective four, qualitative data were analyzed with thematic analysis procedures (Guest, MacQueen, & Namey, 2012) and interpreted in a quantitative manner (Creswell & Plano Clark, 2011). Qualitative data was collected through open-ended questions: "What, if anything,

would have enhanced your Team-Based Learning experience during this course?" and "Please provide any additional information you would like to share regarding your experience as an individual learner or working with your team in this course." The responses were coded and defined within the bounds of three encompassing themes: *student buy-in of TBL, incomplete buy in of TBL by students,* and *suggestions for improvement*. Pivotal data is included in order to define and provide evidence for the three themes that emerged (Guest et al., 2012). A codebook was created that included interpretations of the text responses and "…systematically sorted [the text] into categories, types, and relationships of meaning" (Guest et al., p. 52). The codes resulted in emergent themes and were then bound by a central definition (Esterberg, 2001). One researcher associated with the study, and another individual not associated with the study, color-coded the text responses from the open-ended questions. The resulting codes where cross-checked between the two coders following subjective coding procedures and to ensure intercoder agreement (Guest et al., 2012). Audit trails that documented all data analysis procedures and reasoning were kept in an effort to maintain transparency (Guest et al. 2012). Since the present study only examined the TBL experience amongst a homogenous population, the generalizability is limited. Careful consideration should be given if extrapolating results beyond the target population.

Results

Table 2 contains participant characteristics from the present study. Respondents from AgEdS 450 tended to be male (78%) with a reported age which varied from 21 to 25. The majority were 22 years of age. Fifty-five percent of the students transferred into ISU whereas 45% of students entered ISU directly from high school. The average GPA of all respondents was 2.98 on a 4.0 scale.

Table 2

Participant Characteristics (N = 48)

Gender	
% Male	78.00
% Female	22.00
Transfer Status	
% of Transfer Students	55.00
% of Non-Transfer Students	45.00
Age (mode)	22.00
GPA (mean)	2.98

Each construct received a mean score above four on a five-point scale. The lowest rated construct was within the motivation to learn construct ($M = 4.27$; $SD = 0.44$). Although rated lowest among the three constructs, it is important to note that the mean score was still rated above the *agree* indicator (e.g., 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree). Table 3 displays the *mean* and *standard deviation* of each construct.

Table 3

Overall Construct Rating

Construct	*M*	*SD*
Motivation to Learn	4.27	0.44
Professional Development through Critical Thinking	4.41	0.53
Beliefs and Attitudes about Learning	4.60	0.51

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree

Objective One

Objective one of the study sought to determine student perceptions regarding their motivation to learn in a TBL formatted course. Descriptive statistics were calculated to examine the student perceptions concerning motivation to learn. Although rated lowest by students (M = 4.27; SD = 0.44), this construct rated above the *agree* indicator. Furthermore, it is important to note that all eight statements within the *Motivation to Learn* construct were rated above the *agree* indicator. Standard deviations ranged from 0.55 to 0.99 which indicated that most of the responses were clustered. The highest rated *Motivation to Learn* construct statement was "during this course, my team and I have worked well together" (M = 4.48; SD = 0.55). The lowest rated statement was "I believe I could have done more to receive the grade I wanted in this course" (M = 4.04; SD = 0.99). The mean and standard deviation for all eight statements are displayed in Table 4.

Table 4

Student Perceptions of their Motivation to Learn in a TBL Formatted Course (N=57)

Statement	*n*	*M*	*SD*
During this course, my team and I have worked well together.	48	4.48	0.55
I am satisfied with the grade that I believe I have earned in this course.	48	4.35	0.64
I have found that my team has motivated me to work more collaboratively in this course.	48	4.35	0.56
I made sure I kept up with the weekly readings and assignments for this course.	48	4.33	0.63
The members of my team encouraged each other to give their best efforts.	48	4.21	0.80
I have found that my team has motivated me to work harder in this course.	48	4.19	0.82
The members of my team maintained high standards of performance.	48	4.17	0.88
I believe I could have done more to receive the grade I wanted in this course.	48	4.04	0.99

Note. Construct Grand Mean = 4.27. Construct SD = 0.44.
1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree

Objective Two

Table 5 reports the means and standard deviations for all statements within the *Professional Development* construct, satisfying objective two of the study. Similar to the motivation to learn

construct, all items within the *Professional Development through Critical Thinking* construct were rated above the *agree* indicator ($M = 4.41$, $SD = 0.53$). The lowest rated item within the *Professional Development through Critical Thinking* construct related to students not perceiving an improvement in problem-solving abilities as a result of working on a team, although it was still highly regarded ($M = 4.25$; $SD = 0.81$). Students reported analyzing course content for alternative explanations (e.g. "whenever I read or heard a statement or conclusion in this course, I thought about possible alternatives") ($M = 4.63$; $SD = 0.79$).

Table 5

Student Perceptions of their Professional Development in a TBL Formatted Course (N=57)

Statement	*n*	*M*	*SD*
Whenever I read or heard a statement or conclusion in this course, I thought about possible alternatives.	48	4.63	0.79
I was given the appropriate resources to do well in this course.	48	4.58	0.85
I tried to play around with ideas of my own related to what I was learning in this course.	48	4.50	0.88
I treated the course material as a starting point and tried to develop my own ideas about it.	48	4.48	1.01
Solving problems in a group was an effective way to apply what I have learned.	48	4.40	0.61
Being part of a team discussion has improved my ability to think through a problem.	48	4.35	0.70
I have found that being part of a team has helped to challenge previous ideas and improve my learning.	48	4.27	0.68
When a theory, interpretation, or conclusion was presented in class or in the readings, I tried to decide if there was good supporting evidence.	48	4.27	0.82
I have found that being on a team has helped me become better at problem solving.	48	4.25	0.81

Note. Construct Grand Mean = 4.41. Construct SD = 0.53.
1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree

Objective Three

Table 6 displays descriptive statistics for each item within the *Attitudes and Beliefs about Learning* construct. The overall rating was above the *agree* indicator ($M = 4.27$, $SD = 0.44$). The majority of students felt confident they understood the basic course concepts ($M = 4.85$; $SD = 0.41$) and that they could apply that knowledge to future tasks ($M = 4.81$; $SD = 0.57$). The lowest rated statement related to students perceiving they understood course materials if they tried ("If I didn't understand the course material, it was because I didn't try hard enough") ($M = 3.96$; $SD = 1.20$).

Table 6

Student Perceptions of their Attitudes and Beliefs about Learning in a TBL Formatted Course (N=57)

Statement	*n*	*M*	*SD*
I am confident I understood the basic concepts taught in this course.	48	4.85	0.41
I am confident I can apply the knowledge I have learned in this course in future tasks.	48	4.81	0.57
I expect that I will receive an excellent grade in this course.	48	4.81	0.57
I believe that being part of a team has improved my grades in this course.	48	4.77	0.63
I am certain I grasped the skills that were taught in this course.	48	4.75	0.56
I believe I can perform independently with the knowledge I have gained in this course.	48	4.75	0.79
When I studied in appropriate ways, I was able to learn the material in this course.	48	4.73	0.57
If I tried hard enough, then I understood the course material.	48	4.71	0.50
I am confident I did an excellent job on the assignments and tests in this course.	48	4.69	0.69
I believe solving problems in a group was an effective way for me to learn.	48	4.58	0.87
I am certain I understood the most difficult material presented in the readings for this course.	48	4.58	0.82
I believe solving problems in groups has led to better decisions than solving problems on my own.	48	4.58	0.92
The ability to work with my peers in this class was a valuable experience for me.	48	4.56	0.85
The ability to collaborate with my peers was necessary for me to be a successful student in this class.	48	4.52	0.90
Collaborating with my peers helped me to be a better student.	48	4.42	0.96
Working in teams in class has been a productive way for me to spend class time.	48	4.35	1.02
It was my own fault if I didn't learn the material in this course.	48	4.27	0.96
If I didn't understand the course material, it was because I didn't try hard enough.	48	3.96	1.20

Note. Construct Grand Mean = 4.60. Construct SD = 0.51.
1 = Not at All True of Me, 2 = Sometimes, 3 = Neutral, 4 = Mostly, 5 = Very True of Me

Objective Four

Three themes emerged from the qualitative data collected via open ended questions. The responses collected were grouped into *Student Buy-In of TBL, Suggestions for Improvement,* and

Incomplete Student Buy-In of TBL. Table 7 displays the frequencies and percentages of total student responses (Fall 2014, $n = 44$) regarding the emergent themes.

Table 7

Response Analysis for Student Perceptions of Team-Based Learning

	Fall 2014 $n = 48$ Responses = 60[a]	
Themes	*f*	%
Student Buy-In of TBL	31	51.67
Suggestions for Improvement	26	43.33
Incomplete Student Buy-In of TBL	3	5.00

Note. [a]Total responses represent all valid responses given by students for both open-ended questions.

Student Buy-in of TBL

The *student buy-in of TBL* theme was defined by a set of responses relating to positive comments on the practices in a TBL course (i.e., I enjoyed working with my team, TBL was a great way to learn the course content, etc.). *Student buy-in of TBL* was the most prominent theme that emerged from the qualitative data. Overall, students felt that the TBL format was an effective use of class-time and that it further aided in their understanding of the course material. One student commented, "It was great working in a team because I could hear different interpretations or opinions on the material we covered in class." Another student said, "I liked this type of learning and thought it worked well." One student noted the importance of working in teams that had diverse experiences by saying:

> I liked working as a team because some of these topics were ones that I had no prior knowledge about. To have group members who better understand these topics, really helped me learn more about some of the topics we covered from their personal experience.

Another student stated, "I think that working within teams was a good experience and it helped because everybody gave their input when it was needed and made me look at things from other people's perspectives." Similar comments were echoed throughout the text. Several students mentioned working in teams likely resulted in a better grade or that they felt it was the reason they received a certain grade. One student said, "This was the first time for me working in a team environment and I believe that it led to a better grade in the end." Another student shared a similar view by stating, "[I] thought it was helpful taking the same quiz in the group." The quiz refers to the individual readiness assurance test and the team readiness assurance test taken throughout the semester. "The team-based learning was an effective way to work in the class and I definitely feel that it helped my grade," was another example of a student buy-in to the flipped approach in AgEdS 450. Other students discussed the team emphasis motivated them to engage in the course and the course content. A student supported this by saying, "I enjoyed the team-based learning and think it helped my teamwork skills. It also pushed me to do the readings because I didn't want to let my team down," while another student said, "My team has challenged me to communicate better outside of class." Perceptions of the TBL method seemed to positively improve based on the

comments of one student; "I think that the team-based learning went a lot better than I thought it would at the beginning of the year. I actually enjoyed it." Other students were surprised at how well the teams worked. "In my group when doing the TRAT I was surprised that everyone spoke up and gave their opinion," said one student. Another student stated, "Taking the quiz in a group really helped. The discussion regarding the reading helped the entire team understand the course material better." One student felt that the flipped approach in AgEdS 450 was effective in meeting the true objective of the course by stating,

> I feel like this course did exactly what it was designed to, giving us the opportunity to make the decisions of day to day activities on a working farm and having to understand and deal with the consequences of our decisions and actions.

Suggestions for improvement

Suggestions for improvement was the second most prominent theme identified in the open-ended data analysis. *Suggestions for improvement* was defined by responses which mentioned activities that could enhance the flipped experience in AgEdS 450 (i.e., increase the number of peer evaluations, break the reading into chunks, etc.). Some students felt confused with how assignments for the teams were handled toward the end of the semester. One student said, "It got very confusing toward the end of the semester having so many different assignments for both the team and committee due at the same time," while another student stated, "I think the paper could be done at the beginning of the semester… I think time management could have been better." This comment seems to be in regard to the State of the Farm assignment that students complete to orient them to the working of AgEdS 450 to be better informed of when making decisions. Others felt it would be wise to spend more time discussing how the course operates in the new format. This is supported by one student who said, "Explain why things are structured the way they are in the class. Overall I had a great experience with my committee and team." One student suggested spending time in class explaining "how to work well as a team; maybe give a short presentation about effective teams at the beginning of the course each semester." Other students suggested breaking up the pre-readings for each module. One student suggested providing "A list of goals for each reading," while another said, "break the reading into chunks."

Incomplete Student Buy-In of TBL

The *incomplete student buy-in of TBL* theme was defined by a set of responses which were negative in nature. The negative comments that did occur were not extremely detailed on specifics of the course that would improve student experience, and more general to the course overall. One student noted, "Working in teams for stupid [explicative] assignments in lab was a [explicative] waste of time," and, "it didn't make sense to not do some of the lab assignments in committees." Another student said, "Team-based learning was the biggest joke of my life and I hated this class because of it." One student did not like that the responsibility of the learning process shifted to them by stating that "having a teacher that teaches" would improve their experience in this flipped course. While negative comments did not appear frequently, including the theme was deemed appropriate for disclosure and complete understanding of the student responses.

Conclusions/ Implications/ Recommendations

Student satisfaction is an important component in the continuous revision of AgEdS 450. This study has shown how students perceived their experience in a TBL formatted capstone course. Overall, we conclude students had a positive reaction to the revised AgEdS 450 course at ISU, which employs a flipped approach. The low variability (standard deviation) for each construct elucidates a general consensus regarding positive student perceptions in a TBL formatted course. Overall, the positive findings are consistent with previous literature regarding the implementation

of a flipped approach in agricultural courses (Barkley, 2015; Conner et al., 2014a; Conner et al., 2014b; Gardner, 2012). The findings serve as general reassurance that the move toward a more student-centered course design is appropriate for this specific course; although the present data could also be useful in defending the inclusion of the TBL pedagogical practice in other capstone courses within Colleges of Agriculture, general courses within Colleges of Agriculture, and potentially in courses in other disciplines. Courses taught in a contextual setting seem to be the likeliest beneficiary of these results; however, examining the effect of flipping other courses within Colleges of Agriculture to TBL format would be beneficial. In examining student perceptions of their experiences in the flipped course, we were able to identify specific conclusions relating to each of the three constructs which are presented below.

Peer influence in a TBL formatted course should not be underestimated. We conclude that working in teams positively affected students' motivation to learn in this application of a flipped classroom. Peers motivated one another to work collaboratively and maintained high standards of performance for their team members. This conclusion is consistent with the previous research of Espey (2010) who found that a positive experience in a team contributes to student's desire to learn. The course structure proved vital in ensuring students kept up with the required pre-class preparation. Students were held accountable through individual and team assessment and further group discussions on application exercises (Michaelsen et al., 2004).

The positive results stemming from the *Professional Development through Critical Thinking Skills* construct is particularly interesting. While this study did not truly examine students' critical thinking abilities, it shows promise as a means to follow up on Perry et al.'s (2015) suggestion for exploring the impact course designs have on students' critical thinking abilities. We conclude that the AgEdS 450 taught in TBL format aided in the development of specific abilities related to critical thinking. Specific abilities reported as being improved by the TBL formatted course include; evaluating information for relevance, solving problems, and evaluating information for sufficient evidence. Perry et al. (2014) called for the increase in teaching critical thinking skills by utilizing pedagogical approaches that emphasize active learning, and more specifically, approaches that emphasize effective communication. The TBL format may prove valuable in increasing the specific skills that lead to improved critical thinking abilities of students, as it relies heavily on communication within and between teams (Michaelsen et al, 2004) and has been shown to do so in other disciplines (Currey et al., 2015).

We conclude that TBL practices were regarded as positive experiences in relation to individual learning and especially regarding learning in teams, supporting Mezirow's (2000) assumption that transformative learning calls for a trusting, social context. Students felt efficacious in their ability to understand the most difficult course concepts as a result of the TBL practices. Students reported an overall increase in performance (individually and as a member of a team) as a result of the activities within a TBL formatted course. These conclusions are consistent with previous research by Hazel et al. (2013) who found student performance increased from individuals to teams when using TBL.

While not representative of the overall findings, the negative comments provided by a few students did stand out. Based on the limited data, we conclude that TBL may not be positively viewed by all students, congruent with what Conner et al. (2014a) found in flipping a teaching methods course. It is recommended that considerable time be spent explaining the reason for flipping a course, how to navigate the course design, and the benefits students can expect (Michaelsen et al., 2004).

In line with Conner et al.'s (2014a) suggestion, and further supported by research findings (Barkley, 2015; Conner et al., 2014b; Espey, 2010; Gardner, 2012) the flipped approach to course design seems promising within agricultural contexts. Examining student perceptions of TBL in

other courses within Colleges of Agriculture is needed to further substantiate this claim. For higher education as a whole, these findings may merit the adoption of TBL, as it may provide a more engaging learning environment for students in capstone courses (Michaelsen, Sweet, & Parmalee, 2011).

Consistent with a recommendation from Balschweid et al. (2014), we suggest structured training programs on active, learner-centered teaching approaches, specifically, flipped learning or TBL. If possible, the creation of a dedicated group within agricultural education – interested in flipped or team-based teaching approaches – could design training programs for faculty members within Colleges of Agriculture. This group could develop a certification program requiring participants to meet specific competencies needed for effective flipped instructional design.

The promising results also lead to the development of recommendations for future research. Specific topics the researchers recommend examining include: the impact, if any, of a TBL formatted AgEdS 450 course on students' critical thinking abilities. This may satisfy a similar recommendation by Perry et al. (2014) who called for examining critical thinking in courses that emphasize active learning approaches. The potential impact of student interaction relating to course content should also be examined. Further, it is also recommended that student performance and engagement in a TBL course be compared to those in traditionally taught courses. The final recommendation for future research includes a comparison of perception change by measuring student perceptions before the TBL formatted course and their perceptions after the course. This may provide valuable insight on students preconceived notions of working in teams/groups.

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