

Addressing Problems Encountered in Case-Based Teaching

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ABSTRACT TURF 436 (Case Studies in Turfgrass Management) is the capstone course for turfgrass science majors at the Pennsylvania State University. Students are introduced to problems and complex problematic situations encountered in the management of golf and sports turf and in professional lawn-care operations. Following completion of the orientation case in which students work individually, all other cases are done as team projects, with four- or five-member teams preparing for the discussions of three cases each. Problems encountered in teaching this course included: less-than-full participation by all team members in preparing their respective presentations, poor attendance at class meetings when other teams were presenting, students unprepared to participate in discussions of the cases following their presentation, and consistent grading of team reports. Solutions found to be effective in addressing these problems are provided.

Decision cases and discussion teaching techniques can help students develop their capacities to analyze and solve problems. In contrast to the instructor-centered lecture method of teaching, through which learning occurs passively and largely by revelation, case-based teaching is highly student-centered and promotes learning through a process of discovery. In order for such discovery learning to take place, however, students must fully participate in both small-group and whole-class discussions of the cases under consideration. The purpose of this paper is to identify the problems encountered in case-based teaching, based on the context of my experiences with a case studies course in turfgrass management, and to share several solutions that were developed through trial and error.

Decision Cases

A decision case is an incomplete narrative of a problem—or a more complex problematic situation—that takes the student to the point at which a decision has to be made. The definition of a decision case offered by Christensen (1987) is “a partial, historical, clinical study of a situation which has confronted a practicing administrator or managerial group. Presented in narrative form, it provides data—substantive and process—essential to an analysis of a specific situation, for the framing of alternative action programs, and for their implementation recognizing the complexity and ambiguity of the practical world.”

Under the guidance of a skilled instructor, students can develop an array of important “process” skills through case-based learning. Utilizing a systematic process of inquiry, adapted from Kolb’s Learning Cycle Model (Kolb, 1984) by Turgeon (1993), students begin with a concise and accurate

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Impact Statement

Several modifications were made to a case-based course that improved the quality of the students’ learning experience. The modifications included the introduction of a peer-evaluation system, establishment of a mandatory attendance policy, use of readiness-assessment quizzes and assessment rubrics, designation of question teams, and modeling proper questioning techniques.

description of the situation presented in the case. This is called the *divergence* phase. They then conduct a thorough analysis of the situation by drawing upon relevant knowledge to interpret and enrich their understanding of the situation. This is termed the *assimilation* phase. In the subsequent *convergence* phase, the students attempt to identify issues emerging from the analysis and propose strategies for addressing them. Finally, after selecting an appropriate strategy or strategies, the students develop a detailed implementation plan for solving the problem or ameliorating the situation—called the *accommodation* phase of the process. Often, students realize that successive iterations of this process may be needed to satisfactorily resolve a complex problematic situation.

Discussion Teaching

According to Christensen (1991), “questions are the entry point to the discovery of knowledge.” Discussion teaching involves the use of a typology of questions to lead students through a process of inquiry and, hopefully, toward new insights. Discussion teaching differs from lecturing in several important respects. First, case-based discussion teaching employs a problem-centered approach in which learning is motivated by posing a problem or dilemma that the student will likely be unable to solve ini-

Abbreviations: ARs, assessment rubrics; RAQs, readiness-assessment quizzes; TURF 436, Case Studies in Turfgrass Management.

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tially. In this respect, it mimics the process by which young children learn by confronting new situations and determining—perhaps by trial and error or through some instructional intervention—how to deal with them. As opposed to memorizing a body of material in anticipation of applying it at some future time, case-based learning places the pedagogical “horse before the cart.” For example, students attempting to solve an agricultural problem such as poor drainage in a field may find that they must learn to apply principles of soil physics that explain how water moves—or fails to move—through the soil. The problem provides the motivation to learn concepts and processes that might otherwise be of little interest or enticement when presented in lecture. A discussion class can provide an abundance of this kind of motivation for learning.

Discussion teaching, which is usually central to the case learning process, is not simply asking a series of preplanned questions in class. Although a list of questions should be developed in preparation for a case discussion, only those that harmonize with the flow of the discussion and help to achieve the learning objectives established for the class should actually be used. Of equal importance to questioning is listening to student responses. This is done to gauge individual command of substantive material, the logic of an argument, and the potential contribution of a comment to the group’s continuing dialogue (Christensen, 1991). Finally, discussion teaching involves responding to a question or comment by asking a further question, restating the speaker’s point, requesting additional information, or offering a personal analysis.

The Course

TURF 436 (Case Studies in Turfgrass Management) is a course that employs decision cases for helping students learn how to address problematic situations at the technical, economic, social, and, sometimes, ethical levels. The decision cases used in the course can be accessed at <http://turfgrass.cas.psu.edu> (verified 4 Sept. 2007). The course begins with the assignment of an “orientation case” on which students work individually. Because this case is used to acquaint students with how decision cases should be systematically worked, the instructor leads the class through a series of discussions covering the following: analysis of the different components of the case, identification of the issues emerging from the analyses, designing solution or amelioration strategies for addressing the issues, and implementing the selected strategy or strategies. The class is then divided into nine teams, each made up of four or five members. The results obtained from an online assessment tool, based on Kolb’s Learning Styles Inventory (Kolb, 1984; Smith and Kolb, 1986), are used to develop teams in which different learning styles are represented. Each team is assigned two cases and the dates on which they will make their presentations to the class. They are also asked to develop a case of their own—called a topic case—and are assigned a date for presenting it to the class as well. Each discussion class includes a 15-minute team presentation of an assigned or topic case, a 15-minute question-and-answer period involving the entire class, and a 15-minute wrap-up of the discussion by the instructor. A

formatted case report (Fig. 1) is submitted to the instructor by the team within the week following their presentation.

Problems Encountered in Teaching the Course

The quality of the learning experience for individual team members in discussing their assigned and topic cases and preparing their presentations is influenced by the extent to which each member participates in team meetings. Often, students complained that only one or two team members do most or all of the work, or even show up for meetings.

During classes, the quality of the learning experience is influenced by several factors, including: being present in class, being prepared to discuss the case following a team’s presentation, and participating in the discussion by posing good questions and soliciting satisfactory answers. Some students develop a casual attitude toward class attendance, believing they can get notes from someone else or learn the material directly from the textbook or other source without needing to be in attendance. But acquiring analytical and problem-solving skills comes primarily from practice, not from notes or text readings; thus, one’s presence in class—when issues emerge from analysis and possible solutions are discussed—is essential. Certainly, students are unlikely to benefit from class discussions if they don’t show up; however, they are more likely to actually acquire problem-solving skills if they also prepare for discussions before class and actively participate in the case discussions. But many students come to class unprepared to participate; as a consequence, they ask no questions and even try to hide, hoping they will not be called upon by the instructor.

Finally, properly grading reports submitted by student teams during or after their class presentations is an important part of the feedback provided during the course. Comments provided to the students should be as detailed as possible to ensure that they thoroughly cover the critical points in their description and analysis of the problematic situation presented in the case. While this can involve a considerable amount of work for the instructor, failing to do so deprives the students of an important learning opportunity. A method was needed to provide detailed feedback, but with a reasonable amount of instructor time and effort.

Solutions to the Problems

Team participation was a major problem in the course until a peer-evaluation system was instituted. This system involves the distribution of peer-evaluation forms to team members after each team presentation. On the form, students list their teammates and grade their participation on a 1 to 5 scale, with 5 for superior participation, 4 for adequate participation, 3 for marginal participation, 2 for poor participation, and 1 for no participation. Scores received by each team member are averaged and penalty points are subtracted from the grade awarded for the exercise as follows: minus one-third of the team’s grade for the exercise for an average peer-evaluation score of 3, minus two-thirds for an average score of 2, and minus all points for an average score of 1. Thus, if the team received a grade of 9 out of 10 points for their case report and

presentation, team members receiving a peer-evaluation score of 3 would only get 6 points instead of 9 points for the exercise. The impact of the peer-evaluation system was twofold: it provided a means of individualizing team scores, and it virtually eliminated the team-participation problem.

The class attendance problem was largely solved by: (1) establishing and announcing a course policy of required attendance, (2) reinforcing the policy by distributing a sign-in sheet at the beginning of each class, and (3) posting the attendance records on the online course management system. As the course is taken by senior undergraduates, most in their last semester, some students must invariably miss some classes for job interviews and other university or professionally sanctioned activities. Therefore, the policy allows for up to three excused absences; beyond that, 2 points are deducted from the final grade for each absence. Since implementing the policy, absences have been minimal and few students have lost points for missing class.

The class participation problem was more complex and difficult to address. Students who do not familiarize themselves with the case before class are often not well prepared to ask questions after the presentation of the case by a team. Even if they had read the case beforehand, however, they may still be reluctant to pose questions for a variety of reasons, including shyness or an inability to phrase good questions within the time constraints of the class period. To deal with the familiarization component of the problem, a series of online readiness-assessment quizzes (RAQs) were prepared for each case. Students were informed at the beginning of the course that they are required to satisfactorily complete the RAQ for each case—with a score of at least 70%—before the class in which it is scheduled for presentation. As there are 19 assigned cases (including the orientation case) covered in the course, 1 point is given for each case, plus 1 point for completing the Kolb's Learning Styles Inventory, for a total of 20 points, or 20% of the course grade. Introduction of the RAQs into the course improved participation, but was not a complete solution for the problem. The next thing tried was the assignment of "question" teams for each presentation. Each member of a question team was tasked with posing at least one question to the presentation team at the beginning of the question-and-answer period. This substantially improved participation, as the question team members came prepared to ask questions, in some cases by meeting ahead of time

to work out the questions and the sequence in which they would be asked. Designation of question teams also got students involved who otherwise would have been reluctant to do so, and served as a means of building momentum for an active discussion. There was still a problem, however, with the quality of the questions asked. Without training in proper questioning techniques, students often posed simplistic questions that failed to address key aspects of the analysis or to challenge the validity of the solutions proposed by the presentation team. Thus, a third intervention was tried: instructor modeling. With the instructor's participation in the questioning, the opportunity existed for modeling proper questioning techniques. Also, during the instructor's wrap-up portion of the class, the points made in the questioning could be reinforced, demonstrating how one can request clarification, issue a challenge, or require an elaboration of the scope of the issues being

Case Report	
Title:	Author:
Situation	
In this space, provide a brief write-up of the case from the <i>information</i> presented in the case description. Be sure that you cover all aspects of the case. In doing so, be sure to identify the factors responsible for the deterioration in turf quality:	
Analysis	
In this space, provide an <i>interpretation</i> of the case based on the information given in the description (as you have detailed it in the SITUATION section of this report) and your knowledge of relevant subjects (e.g., plant physiology and nutrition, soil physics and chemistry). Your objective is to assist the reader in developing a richer understanding of the case than what can be obtained directly from the case description.	
Issues	
In this space, simply list the <i>issues</i> emerging from your analysis that you intend to address in the follow section.	
Strategies	
In this space, provide your <i>strategies</i> for addressing the issues listed in the previous section. Do this for each of the issues listed in the previous section. Avoid detailed explanations, as this will be provided in the following section.	
Implementation Plan	
In this space, provide a <i>detailed plan</i> for implementing the above strategies. It should cover the five management functions, including the objectives, a list of the specific tasks in the sequence in which they will be performed, the personnel involved, how you will motivate them to perform the tasks properly, and how you will monitor the operation to ensure satisfactory completion.	

Fig. 1. A format for the written report that is prepared by student teams and submitted after their scheduled presentation of an assigned or topic case.

Assessment Rubric for Beaver Stadium Case					
Name					Points
CRITERIA	Exemplary	Proficient	Intermediate	Unsatisfactory	
Situation Section	2	1.5	1	0	
	All factors responsible for the deterioration in turf quality and their associated causes were identified	Most factors responsible for the deterioration in turf quality and their associated causes were identified	Some factors responsible for the deterioration in turf quality and their associated causes were identified	No factors responsible for the deterioration in turf quality and their associated causes were identified	
Factors	Fine-textured medium situated over coarse-textured (gravel) base results in poor internal drainage.				
	Tarping of field during rainfall events and careful irrigation required to minimize the amount of soil-moisture accumulation.				
	Gradual deterioration of turf from weeds and diseases, requiring periodic replacement of sod.				
	Sod installed in summer of 1993 did not root well, resulting in unstable sod during the playing season.				
	Because of heavy rains during Rutgers game, all sod was uprooted, destroying the playing field.				
Analysis Section	2	1.5	1	0	
	Satisfactory interpretation of all factors responsible for the deterioration in turf quality	Satisfactory interpretation of most factors responsible for the deterioration in turf quality	Satisfactory interpretation of some factors responsible for the deterioration in turf quality	Unsatisfactory interpretation of any of the factors responsible for the deterioration in turf quality	
Relationships	Poor internal drainage due to perched water table above interface between soil and underlying gravel blanket.				
	Weed and disease problems were reflections of poor internal drainage.				
	Despite initial rooting, heat stress, possibly coupled with disease, caused the loss of roots, resulting in loose sod at the beginning of the 1993 football season with little prospect of rooting until later in the fall.				
	Heavy rains during the Rutgers game cause major uprooting of sod, destroying the playing surface.				
Issues Section	2	1.5	1	0	
	Identification of all issues emerging from the analysis of factors responsible for the deterioration of turf quality	Identification of most issues emerging from the analysis of factors responsible for the deterioration of turf quality	Identification of some issues emerging from the analysis of factors responsible for the deterioration of turf quality	Identification of none of the issues emerging from the analysis of factors responsible for the deterioration of turf quality	
Issues	Poor internal drainage due to perched water table from having a gravel blanket beneath 18-20 inches of silt-loam soil.				
	Poorly rooted sod torn from field during a rain-soaked game needed to be replaced.				
Strategies Section	2	1.5	1	0	
	Brief description of appropriate strategies for dealing with all of the issues in the case.	Brief description of appropriate strategies for dealing with most of the issues in the case.	Brief description of appropriate strategies for dealing with some of the issues in the case.	No appropriate strategies for dealing with the issues in the case.	
Implementation Plan Section	2	1.5	1	0	
	Detailed listing of actions for dealing with all of the issues in the case.	Detailed listing of actions for dealing with most of the issues in the case.	Detailed listing of actions for dealing with some of the issues in the case.	No detailed listing of actions for dealing with the issues in the case.	
TOTAL POINTS AWARDED OUT OF A POSSIBLE 10 FOR THIS CASE:					

Fig. 2. Assessment rubric for the Beaver Stadium case.

addressed by the presentation team. As a consequence of these three initiatives—requiring completion of RAQs before class, designation of question teams, and instructor modeling—the quality of student participation in class discussions improved dramatically.

Finally, the problem of providing detailed feedback in the grading of team reports was addressed through the development and use of case-specific assessment rubrics (ARs). Figure 2 provides an example of an AR developed for the Beaver Stadium case (Turgeon, 1999). As the key points that should have been included in the SITUATION and ANALYSIS sections are listed in the AR, along with the other sections of the report, grading is simplified. An AR is completed and attached to a team report soon after its submission, with an invitation to resubmit a revised report for a higher grade.

Summary and Conclusions

The introduction of a peer-evaluation system dramatically improved participation in team activities and provided a vehicle for individualizing team scores. The establishment of a mandatory attendance policy, along with consistent use of a sign-in sheet for each class, improved class attendance. Using readiness-assessment quizzes, designating question teams, and modeling proper questioning techniques substantially improved the quality of student participation in class discussions. And the use of assessment rubrics provided excellent feedback to students and provided an effective vehicle for grading reports in a fair and consistent manner. Despite all of these improvements, however, discussion teaching with decision cases—the “case” method—remains quite challenging. Each discussion class is a journey in which there can be—and often are—many surprises, as new analyses and solutions are presented and different questions posed each time the course is offered. For example, in the Beaver Stadium case (Turgeon, 1999), *my* solution was to plant sand-based sod (thus creating a sand blanket at the surface), drill numerous holes through the silt-loam soil to the gravel blanket 51 to 56 cm below the surface, and backfill the holes with sand in order to provide bypass drainage to the drain pipes within the gravel blanket. One student proposed a simpler alternative of trenching 30 to 45 cm into the soil about every 5 m across the field, placing drain pipes in the trenches (that are then connected to a larger drain pipe along one or both sides of the field), and backfilling the trenches with sand to provide a way of disposing of water that would otherwise accumulate in the sand blanket. Variations of *his* solution, which ignored the gravel blanket entirely, are now often employed for improving drainage on sports fields and golf courses. Such incidents are not uncommon, as many students have learned ways of dealing with problems during years of field experience that they are eager to share in class. Thus, one of the most important things that a discussion teacher does is to ensure that an environment is created and sustained in which students feel comfortable sharing their ideas, including some very innovative ones, in classroom presentations and discussions.

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About the author...

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Upon returning from a tour in Vietnam as an Army helicopter pilot in 1967, I reported to my next duty station where I requested a non-flying assignment and was pleased to be assigned as a meteorology instructor. After a four-week course of instruction on teaching methods and a sufficient period in which to learn the material, I began my service as an instructor and quickly developed a love of teaching, which led to graduate school and an academic career. I'm still in love with teaching.

