

Teaching Tip

Enhancing Student Engagement: A Group Case Study Approach

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ABSTRACT

Computing professionals work in groups and collaborate with individuals having diverse backgrounds and behaviors. The Accreditation Board for Engineering and Technology (ABET) characterizes that a computing program must enable students to attain the ability to analyze a problem, design and evaluate a solution, and work effectively on teams to accomplish a common goal. It is important for instructors to enable students to experience team work and collaboration while preparing them for their professional careers. Case-study analysis is an important method for engaging students in active collaborative learning. Forming groups and using case-study analysis is an effective way to integrate theoretical knowledge and real-world professional practices into the curriculum. This paper describes an innovative pedagogical and practical approach for integrating group case-study learning in a course. Our findings suggest that students were effectively able to share diverse perspectives and apply conceptual material to real-world situations in case-study learning activities.

Keywords: Case study, Collaboration, Experiential learning & education, Team-oriented problem solving

1. INTRODUCTION

The development and implementation of technology solutions and the management of Information Technology projects (Kilamo et al., 2012) is done in teams. Information Systems (IS) professionals must be able to communicate technical issues to non-technical members and organizational issues to technical members in order to bridge the gap between them. They collaborate with individuals having varying backgrounds, work ethics, and personalities while participating in the same set of activities to achieve their common goal. It is important for IS students to experience the dynamics of teamwork and collaboration while preparing for their professional careers. *The IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems* (Topi et al., 2010) recommends the use of group work and case studies for discussion and reflection in order to grant students opportunities to work together and identify issues in real-world settings. The Accreditation Board for Engineering and Technology (ABET) characterizes that a computing program must enable students to attain the ability to analyze a problem; design and evaluate a solution to meet desired needs; use current techniques, skills, and tools necessary for computing practices; and work effectively in teams to accomplish a common goal. The computing education community is continuously seeking innovative ideas, effective tools, and valuable experiences to

enable students to work effectively in teams (Kilamo et al., 2012).

Active learning is an instructional method that engages students in the learning process by requiring them to thoughtfully perform meaningful learning activities (Prince, 2004). One form of active learning is cooperative learning, which incorporates a structured form of group work where students pursue common goals while incorporating individual accountability, mutual interdependence, face-to-face interaction, appropriate practice of interpersonal skills, and regular self-assessment of team functioning (Johnson et al., 1998; Prince, 2004). A case-study approach to teaching is one important method that engages students in active collaborative learning. It is based upon a situation or event in the real world (Noblitt et al., 2010; Yadav and Beckerman, 2009) and is experiential by nature, as it allows students to apply theoretical and conceptual knowledge gained from lectures or texts to case problems with which they are unfamiliar (Krain, 2010).

The use of case studies effectively introduces real-world professional practices into the classroom (Towhidnejad et al., 2011b). It enhances students' analytical thinking, problem-solving, communication, collaboration, and decision-making skills (Backx, 2008; Prince and Felder, 2007; Richardson et al., 2008) while integrating multiple viewpoints, encouraging discussion, and promoting greater understanding of the course material (Kathiresan and Patro, 2013). Students'

participation and engagement in solving interesting real-life problems allows them to tie together concepts from different topics or subject areas (Chamany et al., 2008) and provides them motivation for learning (Boubouka et al., 2010; Yadav et al., 2010). Case studies have become an integral part of the pedagogy in various disciplines (Kathiresan and Patro, 2013). There has also been an increased effort in integrating case studies into computing courses (Towhidnejad et al., 2011a). Information Systems educators often use cases published in outlets like *Harvard Business Review* and *Harvard Business Cases*, and IS education journals (e.g., *Journal of Information System Education*) in their courses (see, for example, Austin and Short, 2009; Coutu, 2007; Steenkamp et al., 2013; or Willey and White, 2013). Cases encourage the development of higher-level skills by promoting active learning-by-doing, as compared to the more traditional lecture-based approach (Kruck, 2013).

Many educators perceive case studies to be a time-consuming effort that results in little student interaction (Kathiresan and Patro, 2013). Noblitt et al. (2010) note that faculty are not encouraged by the overall level of student class participation in case studies. According to Sudzina (1997, p. 204), “the heart and soul of teaching through the case study method is the case discussion.” Therefore, it is necessary to find ways to effectively engage students in case discussions.

The objective of this paper is to present an approach to integrate group case-study learning into the classroom in order to enhance students’ engagement, individual contributions, teamwork, and learning. This approach allows students to interact with a diverse set of individuals as a collaborator, facilitator, and leader to generate new knowledge by integrating course learning, prior experiences, interactions, and by brainstorming new ideas with each other. We report our experiences and results from three courses (*Information Assurance & Security*, *IT Project Management*, and *Cyber-Security*) in two semesters during which we used our group case-study approach.

The rest of the paper is structured as follows. In the next section, we describe our group case-study approach, followed by teaching suggestions. This section is followed by data analysis and results. Finally, we present our discussions and conclusion.

2. THE ASSIGNMENT: GROUP CASE-STUDY

Students in the computing field are primarily accustomed to problems with defined outcomes and do not have much experience with systematically analyzing a case study. For most students, the case method represents a big change, and change brings fear (Richardson et al., 2008), which may lead to withdrawal from the activity.

A typical case-study implementation in a class includes the following steps: i) reading the case, ii) preparing for the case discussion, iii) participating in class discussions, and iv) submitting written responses to the assigned questions after the discussion (either individually or in groups, depending on the instructor). The instructor generally acts as a moderator during the in-class discussions and contributes specific points as necessary. When we had used case studies in earlier semesters, we found that some students did not read the case before coming to class and did not make good use of class time to engage in the discussions, but instead read the case study for the first time in the class or engaged in non-task related activities. When the assignment questions were given to the students, requiring them to work in groups and answer collectively, some groups divided the questions among team members instead of brainstorming together and each team member individually answered the questions assigned to him or her. While many students did engage with class, dividing the work and doing the tasks individually instead of collectively by some teams defeated the purpose of students’ interaction and participation in case studies. Table 1 shows various case-study analysis approaches we have tried over the last few years.

1.	We asked students to read the case before coming to the class. On the day of case-study discussions, the case was discussed with the entire class as a group. Next, students were asked to form teams of four (outside the class) and submit their responses as teams to the assigned questions.
2.	We asked students to read the case before coming to the class. Next, the students formed teams of four (inside the class) and discussed the case with their team members. Next, the case was discussed with the entire class as a group. Lastly, the students were asked to submit the responses to the assigned questions as teams.
3.	Same as #2 above, except students were given time to read the case in class.
4.	We assigned questions to students one week prior to the case-study discussions and asked them to submit their individual responses before the case study was discussed in class. On the day of case-study discussions, the students were asked to form teams of four and discuss the case with their team members. Next, the case was discussed with the entire class as a group. Lastly, the students were asked to submit the responses to the assigned questions as teams.
5.	Same as #4 above, but after class discussion, we asked students to individually resubmit their responses to the questions assigned earlier. The average of the two scores was a student’s score on the written component of the case study. (We also tried using the higher of two scores as a student’s score on the written component of the case study).
6.	Same as #4 and #5 above, but after class discussions we asked students to write a case-study report (as a team) instead of responding to the questions assigned earlier.
7.	The group case study approach discussed in this paper

Table 1: Case-Study Analysis Approaches - Our Attempts

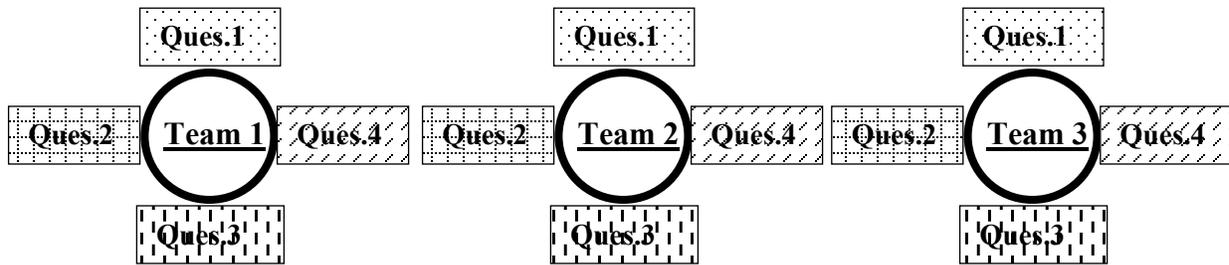


Figure 1: Main Groups

We realize the importance of conducting case-study analysis such that the environment is vibrant, dynamic, and full of energy and participation. Students generally relate more to a topic or teaching approach if it is tied to their experiences and goals. We designed our group case-study approach in a way that allows instructors to tie in the three aspects of attending to student thinking: i) identify students’ ideas and reasoning, ii) interpret the meaning students were trying to convey, and iii) evaluate the ideas and reasoning inferred from students (Levin and Richards, 2010) in real-time while the discussions were taking place in the class.

Our group case-study approach consisted of three parts and involved students in both individual and group-based tasks (Table 2).

<p>Part 1: Pre-Class Discussion [Individual Task]</p> <ul style="list-style-type: none"> Segment 1: Case-study reading before coming to the class [Individual] Segment 2: Warm-up writing exercise on the day of discussion [Individual] <p>Part 2: In-Class Discussion [Group Tasks]</p> <ul style="list-style-type: none"> Segment 1: Main groups formation (similar to functional groups in organizations) Segment 2: Expert groups formation (similar to task forces in organizations, represented by experts from various functional groups) Segment 3: Experts return back to the main groups Segment 4: Full class discussion <p>Part 3: Post-Class Discussion [Individual Task]</p>

Table 2: Group Case-Study Analysis Approach

2.1. Part 1: Pre-Class Discussion

In the first part, we directed students to read the case study before coming to class. At the beginning of the class, we asked students to write and submit their individual responses to a question from the case study. This question primarily asked for the case study overview or the facts described in the case study. It was aimed towards helping students retrieve from short-term memory case details in preparation for further class discussion and connect to the case at a basic level. This activity also enabled the instructor to identify students who had not read the case prior to coming to class. We emphasized to students that this activity was similar to warm-up exercises

done by athletes before a match. We allocated approximately five minutes to this exercise.

2.2. Part 2: In-Class Discussion

The second part was an in-class discussion broken into four time-limited segments. During the first segment, students were asked to form groups of four students each. We told the students that each group represented a functional unit of an organization in which they wanted to work after graduation. This mapping allowed us to generate students’ relate-ability to the case and discussions. Next, we passed four sheets (of different colors) to each group, with each sheet having one question on it (for example, Question 1: blue sheet, Question 2: green sheet, etc.) (Figure 1). The students were given moderate to complex questions that allowed them to integrate theoretical concepts into the situation presented in the case. The student receiving the sheet was deemed to be an expert on the question on the sheet.

In the second segment, we asked students to leave their original groups and form new color-coded expert groups so that the “experts” for each area of the case study were together. So students with blue sheets (Question 1) formed a group, students with green sheets (Question 2) formed another group, and so on (Figure 2). Each color-coded expert group discussed and brainstormed to answer the question on their colored sheets, with each student acting as a representative of his or her original (main) group.

We told students that this segment was similar to the meetings attended by representatives of various functional groups to brainstorm and discuss a problem faced by an organization. We emphasized to students that each functional unit in an organization has its own priorities with an aim towards achieving organizational goals; the students in the groups may also have different thoughts (which needed to be respected) with an aim towards arriving at the best possible solution for the problem at hand. We assigned approximately 15 minutes to this segment, during which the students brainstormed with each other and participated in healthy discussions.

After the second segment was over, we asked students go back to their original groups for the third segment (Figure 1). The third segment involved each “expert” student sharing and explaining answers to their assigned question, which they had discussed in the expert groups with the rest of the main group. All group members were encouraged to ask questions, seek clarification, and give their feedback while brainstorming with each other. We emphasized to them that this segment was similar to a situation in which a representative from a

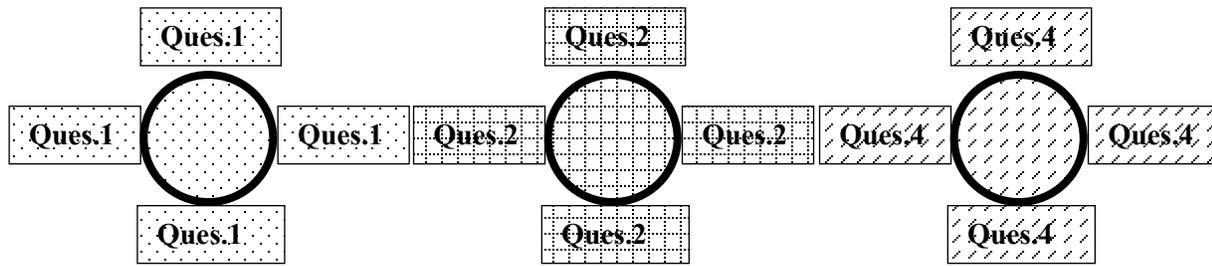


Figure 2: Expert Groups

functional unit in an organization attends a meeting with other functional groups' members and after coming back, shares or brainstorms his or her knowledge with other members to arrive at a solution that best reflects their team's view. We assigned approximately 25-30 minutes for this segment.

The instructor took on the role of a coach in the class discussions during the second and third segments. The instructor supported the students by randomly visiting the groups, observing their interactions, and discussing the questions with them. The instructor's comments helped motivate the groups, improve and enhance their solutions, and get them back on track if needed. It also enabled the instructor to identify students' ideas and reasoning, interpret the meaning students were trying to convey, and evaluate the ideas and reasoning inferred by students in real-time. This understanding assisted the instructor in framing additional questions and providing more clarifications to the entire class as necessary during the next segment. The students were encouraged to take notes during their discussions.

In the fourth segment, the entire class was asked to form a big group by arranging chairs into a big circle. The class then began discussing the case study together. This activity was compared to an open, all-heads meeting taking place in a company. The instructor took the role of a facilitator or coach and further challenged students by asking additional questions, providing clarification as needed, and summarizing the case. The class ended with a general discussion of students' reactions to the case study. We assigned approximately 20 minutes to this segment.

Some of the case studies we have used in our courses include *iPremier (A): Denial of Service Attack* (Austin and Short, 2009), *We Googled You* (Coutu, 2007), *The AtekPC Project Management Office* (McFarlan et al., 2007), and *Partners Healthcare System: Transforming Health Care Services Delivery Through Information Management* (Kesner, 2010). Table 3 illustrates some sample questions we used for the case studies.

2.3. Part 3: Post Class-Discussion

In the third part of the case-study approach, the students were required to submit individual written responses to the questions discussed in class. Many students told the instructor that they enjoyed the case discussions and although it was not required, they further brainstormed outside the class (both face-to-face and via discussion board, SMS) before working on their final individual submissions.

iPremier (A): Denial of Service Attack (Austin & Short, 2009)	
Warm-up Question	What is this case about?
Question 1	Discuss some techniques used by hackers to interrupt or suspend services of a host connected to the Internet.
Question 2	What is iPremier's management culture? Do you think their management culture was also a reason for their lack of preparation? Why?
Question 3	Analyze the reasons for iPremier's lack of preparation and give recommendations on how they could have been better prepared for the problem.
Question 4	Identify the risks faced by iPremier as a result of the crisis. What are iPremier's priorities after the attack?
Full class discussion (Question 5)	What are some lessons that can be learned from this case? Give suggestions to a company in dealing with crisis situations like this one.

We Googled You (Coutu, 2007)	
Warm-up Question	What is this case about?
Question 1	What were Virginia Flanders' initial reactions about Mimi? How and what did Virginia Flanders find out about Mimi's past?
Question 2	Should Fred hire Mimi despite her online history? Why or why not?
Question 3	By using the Internet, what do many prospective employers try to find out about candidates? Also, discuss their motivation behind these searches.
Question 4	Consider that your group is assigned a task to interview and hire some candidates for your company. Will you be in favor of using the Internet to find information about the candidates? Why or why not?
Full class discussion (Question 5)	Discuss some lessons that students who are planning to apply for jobs/ internships can learn from this case?

Table 3: Sample Case-Study Questions

2.4. Grading

Students were assigned points for every case study. Each case study included both an individual score and a group score. The

individual work constituted 50 points (10 points for the warm-up exercise and 40 points for the written post-class discussion questions response). The in-class group activities constituted 50 points (20 points for the expert group performance, 20 points for the main group performance, and 10 points for the full class-discussion performance).

3. TEACHING SUGGESTIONS

In general when students are asked to work in teams, they form groups consisting of friends and peers with whom they are most comfortable working. Although this approach has its own merits, it does prohibit students from stepping out of their comfort zones and working with different kinds of individuals. An important goal of group work is to enable students to gain experience working with different types of individuals, a situation they are most likely to face in real life when they join their professional careers. In addition, professionals in real life do not have the luxury of selecting their clients, project partners, and/or other stakeholders.

In our approach, students formed their own (main) groups for each case study at the start of the class. However, for each case study, the instructor randomly assigned questions to each member of the main group so that the students were most likely to have different members every time they formed their expert groups for each case study. This approach enabled students to work with different individuals. In order to minimize repetitiveness, for some case studies we allowed students to assign questions among themselves instead of getting a question assigned by the instructor. The students discussed with each other and picked the question with which they were most comfortable, therefore truly performing as experts for that question.

We have used our approach in classes consisting of 20 to 25 students. For larger classes, an option is to divide the expert group for each question into two parts, a participant sub-group and an observer sub-group. Individuals in the observer sub-group can be assigned to work either as a partner (like in pair programming) or observe the group dynamic and behavior, listen to the questions and answers, and give (anonymous) feedback on behavior to the members of the participant sub-group.

Currently, we assign the same (group) score to each member of the groups (main and expert). We plan to use peer input and the group score to arrive at fair individual grades (Kinser, 2007). After the case study, group members will unanimously decide a weighted distribution of individual contributions before the instructor grades the case. This step will determine how the points earned on the group task will be allocated among members. Each group will have 100 points per person in the group (so four-member groups will have 400 points). The group may assign any combination of points that equal 400 points. However, individual credits will be capped at 110 points. For example, if the group score is 90, and the group decides to award 110 points to Member A (who contributed more) and 90 points to Member B based upon their contributions, A's individual score will be 99, while B's will be 81. This will provide students the learning experience and real-world correlation by promoting corporate-world skills such as negotiation, effective team collaboration, speaking one's opinion in a group, and successful team and individual boundary-setting (Kinser, 2007).

4. EVIDENCE: DATA ANALYSIS & RESULTS

We administered a survey towards the end of the semester to assess student perceptions of our group case-study approach. The items were measured using a seven-point Likert-type scale. Out of 56 surveys that were distributed in the classes, 52 (92.8%) were fully completed and returned. We achieved a high response rate since the anticipated importance of the survey contents to respondents was high. The results of the survey are shown in Table 4.

The survey results demonstrate that students had positive attitudes towards the group case-study approach. The students felt that the case studies made course learning more relevant and beneficial to them. They were comfortable with the efforts required to participate in the activities and felt that the case study was implemented in a way that was useful and beneficial to them. The results indicate that the approach helped students share diverse perspectives with others, reconcile differing viewpoints, and refine understanding through discussion and explanation. Some of the students' comments follow:

- *Good group work makes it easier to understand.*
- *I enjoy coming together with classmates to share my opinion and listen to theirs.*
- *The case studies are good because they give you the opportunity to act in real world situation.*
- *I like the team work in the case studies.*
- *Good team interactions. Team work is fun.*
- *Case studies are a great learning experience.*
- *They are a good way to show real life examples and learn what was wrong and what was right.*

Overall, students felt that that the case-study approach helped them develop communication skills and apply conceptual material to real-world situations. One of my colleagues who had observed case-study discussions in my classes noted the following:

I observed one of Dr. Taneja's classes several years ago, and in that class, Dr. Taneja used groups to discuss a case study. However, in that class it was apparent that some students had not read the case study before coming to class, and some students did not make good use of class time to engage with class concepts, but instead read the case study, engaged in off-task behaviors. Thus, while many students did engage with class concepts and use their groups to help further their understanding, other students did not. Dr. Taneja has worked over the past several years to try new techniques for assigning case studies so that not just the most motivated students would benefit from in-class collaboration, but many more of the students. In my view, this class demonstrated some of the most improved pedagogy I've observed in my career. Dr. Taneja took a more traditional approach to small group work that worked okay and transformed the classroom into a bustling center for dialogue and discussion.

Question	Average	Std. Dev	Median
1. The effort required to participate in case study is fine.	6.12	0.70	6
2. I like participating in case study discussions.	6.15	0.75	6
3. The case study discussion makes course learning more relevant.	6.10	0.80	6
4. The case study discussion makes course learning more beneficial.	6.13	0.84	6
5. The use of case study is a useful learning experience.	6.21	0.78	6
6. The use of case study is a beneficial learning experience.	6.19	0.84	6
7. Class case study discussions allow students to apply conceptual material to real-world situations.	6.25	0.71	6
8. Class case study discussions allow students to share diverse perspectives.	6.15	0.78	6
9. Class case study discussions allow students to reconcile differing viewpoints.	6.10	0.87	6
10. Class case study discussions allow students to refine understanding through discussion and explanation.	6.23	0.90	6
11. Class case study discussions allow students to develop stronger communication skills.	6.12	0.88	6
12. Class case study discussions allow students to share their ideas with teams.	5.92	1.03	6

Note: Strongly disagree[1] to Strongly agree[7]

Table 4: Results

The survey results, our observations, peer observations, and students' comments suggest the effectiveness of the group case-study approach described in this paper. Our group case-study approach motivated students to read the case before coming to class (to answer the warm-up exercise question), participate in brainstorming and group discussions (in-class group-based exercises), and synthesize their learning by individually answering all assigned questions (post in-class discussion) instead of each group member focusing on one question, as was done in some of the earlier approaches.

5. DISCUSSION & CONCLUSION

Collaboration and teamwork is an important aspect in computing disciplines. Case studies are found to have an important role in developing skills and knowledge among students in various disciplines (Davis and Wilcock, 2014). In modern pedagogical approaches, the learner plays a central role and the role of the instructor is to enhance the learning by applying the right teaching methods and providing a suitable learning environment (Kilamo et al., 2012). This paper highlights an effective way of incorporating and conducting group-based case studies in a course.

Many educators perceive case studies to be lengthy, time-consuming, and repetitive tasks that allow for less student interaction. As mentioned previously, Sudzina (1997) believes, "The heart and soul of teaching through the case study method is the case discussion." Therefore, it is necessary to find ways to effectively engage students in case study discussions.

We used our group case-study approach in a way that challenged students' thinking and allowed them to understand and apply course concepts to real-life scenarios. Some similar formats of working in groups are used in strategic retreats in organizations (for example, working in groups to formulate strategic plans), so applying such a

format in a classroom setting as done in our group case-study approach is fitting for IS students.

We found that integrating group case studies into our courses, as described in this paper, allowed students to share diverse perspectives, reconcile differing viewpoints, develop communication skills, and apply conceptual material to real-world situations. As noted by our colleague, the approach "transformed the classroom into a bustling center for dialogue and discussion." Our data, collected by surveying students, suggests that our goal of effectively engaging and motivating students to participate in case studies and apply conceptual material to real-world situations was met. We hope the discussion of this group case-study approach will encourage instructors to consider adopting this method or its characteristics as suitable to their pedagogical needs.

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