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Teaching Tip
Applying Team-Based Learning in Online Introductory Information Systems Courses

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ABSTRACT

Over the last two decades, the academy has experienced a renaissance of diversity in pedagogical techniques with the introduction of experiential learning, active learning, flipping the classroom, and, more recently, team-based learning (TBL). TBL adopts a two-stage process that incorporates individual learning with team collaboration. While frequently implemented in a face-to-face classroom, TBL has received limited attention in the online learning environment where geographically distributed, asynchronous learning poses challenges to its fundamental design. In particular, coordination costs and sequential inter-dependencies within the learning experience create unique challenges to online environments where students use limited communication channels compared to the traditional, face-to-face environments. This teaching tip discusses the authors' experiences translating the principles of TBL and its learning sequence to an online introductory information systems course. We present instructor observations and qualitative feedback from students as the approach was implemented, including a model that outlines key activities in its implementation. We then conclude with a series of teaching suggestions to fellow academics seeking to adapt TBL to the online environment in their courses.

Keywords: Team-based learning, Online education, Virtual teams, Collaboration, Curriculum design & development

1. INTRODUCTION

The academy has experienced a renaissance of diversity in pedagogical techniques over the past two decades with the introduction of experiential learning (Huang and Behara, 2007), active learning (Williams and Chinn, 2009), flipping the classroom (Mok, 2014), and team-based learning (TBL) (Sloep, Berlanga, and Retalis, 2014). While all techniques are valuable within the academy to ensure a diverse educational experience for students to prepare them for the rigors of the information systems profession, TBL focuses exclusively on the importance of small team-based discussion and learning to influence a wide variety of educational outcomes (Michaelsen, 1992). TBL has been shown to improve educational outcomes in the social sciences, business, and medical disciplines (Haberyan, 2007). For instance, Haberyan (2007) conducted a study comparing traditional "chalk and talk" teaching against the TBL method and found that students learned more from the TBL method, TBL courses are more effective for applying course concepts, and TBL courses are more interesting, enjoyable, and motivational than traditional courses.

Developed by Larry Michaelsen in the early 1980s, TBL focuses on promoting higher-level thinking skills in students by creating cooperative learning structures that stimulate curiosity, student interdependence, and individual accountability within small team settings (Hernandez, 2002; Michaelsen and Sweet, 2008a, 2008b). The primary design of TBL is twofold: learning sequence and course design. First, the learning sequence begins with a similar pattern to a flipped classroom where students review course material individually to prepare for team-based learning activities. An individual Readiness Assurance Test (iRAT) (e.g., a graded quiz) is administered to establish a baseline of each student's knowledge or readiness for team-based activities.

Student teams then collectively tackle the same assignment via a team Readiness Assurance Test (tRAT). The tRAT allows students to engage with one another about their thought processes when completing the iRAT and develop consensus for a single team answer based on the collective wisdom of the team and its deliberations. The iRAT establishes a process for individual accountability that enables trust to be developed among team members by assuring each member has reviewed the course material (i.e., iRAT) prior to

accomplishing team tasks (e.g., tRAT). The tRAT enables teams to engage in knowledge sharing to reinforce course concepts and prepare the students for how to develop consensus. Team members may not always agree on a specific choice, but they compromise and engage in discussion to complete the tRAT.

The instructor facilitates this process by providing feedback (such as a quantitative grade or qualitative feedback) at the individual and team levels. After receiving feedback, the teams can engage in a variety of learning activities that create opportunities for teams to apply the course concepts (e.g., cases, simulations, critical thinking assignments, or scenario-based decision-making activities).

Figure 1 provides an overview of the more detailed TBL sequence discussed above. By its design, TBL introduces reinforced learning through diverse assessment and learning activities. The individual and team level assessments encourage the development of self-efficacy and team consensus, while the activities focus on the application of conceptual knowledge by the teams.

Course design, the second component of TBL, focuses on the instructional preparation of the course. In the TBL environment, instructors are facilitators in the learning process who primarily foster engagement within and among the teams (Hernandez, 2002; Haberyan, 2007). The instructor designs the course by focusing on a central instructional question: what should students be able to do instead of what should students know. Instructors then design the course based on repeat iterations of the learning sequence for each topic.

In addition, TBL focuses on four core principles to ensure effective learning (Michaelsen, 2002; Michaelsen and Sweet, 2008a, 2008b). The first principle is that teams must be properly formed and managed. The second and third principles focus on holding students accountable for their individual and team's work and providing the necessary instructor feedback to ensure students are provided direction in the learning process. Lastly, the instructor must ensure assignments are designed to promote both learning and team development so that the two may mutually reinforce each other. The key to this design is a technique colloquially referred to as the 4 Ss:

> (1) assignments should be designed around a problem that is significant to students, (2) all of the students in the class should be working on the same problem, (3) students should be required to make a specific choice, and (4) teams should simultaneously report their choices (Michaelsen and Sweet, 2008a, p. 20).

While TBL has demonstrated its effectiveness in traditional classroom environments, the technique has received limited attention in the online learning environment where geographically distributed, asynchronous learning poses challenges to the TBL approach (Palsolé and Awalt, 2008; Gomez, Wu, and Passerini, 2010). In particular, specific choice and simultaneous reporting pose challenges to online learning environments where students use limited communication channels compared to the traditional, face-to-face environments and do not meet synchronously (Palsolé and Awalt, 2008). Furthermore, students work on the same problem simultaneously within the face-to-face TBL approach creating opportunities for real-time discussion and evaluation of opinions. For instance, the instructor in a face-to-face classroom floats among the teams to provide support and can draw on discussions from one group to another in real-time to foster dialogue and debate when discussing team choices. While instructors in various disciplines have attempted to resolve these issues, TBL in online learning environments is still in its infancy, suggesting opportunities for instructors to share their experiences and tips on implementation. As Michaelsen and Sweet (2008b) note, the transition from "chalk and talk" to the TBL approach requires a fundamental change in the way an instructor thinks about what happens in the classroom. This same mental approach must be taken again to consider the impact of an online learning environment on the TBL approach.

The purpose of this teaching tip is to outline the authors'

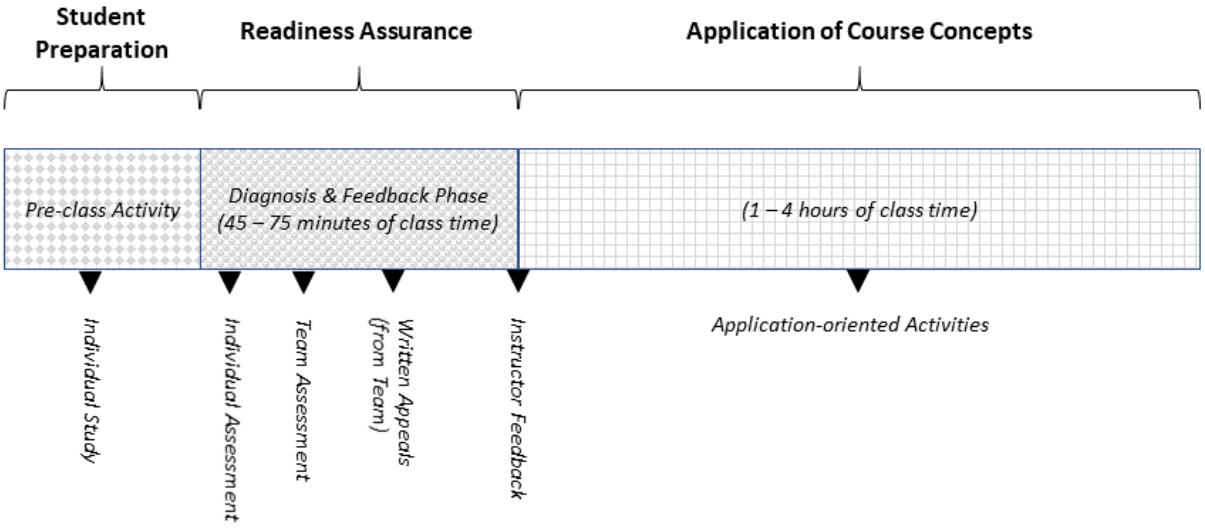


Figure 1. Overview of TBL Approach

experience translating the principles of TBL and its learning sequence to an online introductory information systems course. The TBL approach was adopted for traditional, face-to-face courses and was subsequently adapted to an online learning environment. The next section highlights the implementation challenges and decisions made for translating the TBL approach. We then present qualitative observations and evidence to describe the student experience with TBL across multiple sections of this course over several years. We conclude with teaching suggestions for instructors seeking to adopt TBL in online learning environments.

2. IMPLEMENTATION

The online TBL approach was implemented in undergraduate introduction to information systems courses taught in the business school of a large, urban, southeastern university over the past five years. The course is offered in a fourteen-week schedule divided into seven learning modules focused on the role of technology in the business environment and how technology affects the various business fields (a course learning objective). Prior to its online adoption, the face-to-face introductory information systems course was identified as the ideal course for the business school to meet the university's Quality Enhancement Plan (QEP) focus on learning in a team environment. This decision was primarily driven by the course being a part of the business undergraduate core curriculum that covers a variety of team-based concepts (e.g., knowledge management, group decision-making, collaborative technologies, social media, and telecommunications). After being implemented in the face-to-face environment, the business school developed an online Bachelor of Science in Information Systems program as part of its enrollment growth strategy and online education. To ensure consistency in QEP documentation for accreditation and student learning experience across learning formats, the online course adopted TBL for its learning approach.

To design the course for online TBL, an assessment was first made of the existing online infrastructure and its ability to adapt the TBL approach to this environment. Key challenges associated with the adaptation of TBL to the online environment were: 1) challenges to team coordination during a module period while allowing for asynchronous class participation, 2) managing the scalability associated with online courses that do not possess the same physical limitations for seat capacity as face-to-face courses, and 3) ensuring simultaneous reporting of the applied concepts assignments to the class by teams. The university utilizes a Learning Management System (LMS), Canvas by Instructure, for all courses with a course policy requirement to utilize the Canvas calendar for course assignment deadlines.

Canvas possesses the ability to create groups (i.e., teams) and provide them with a workspace that includes announcements, discussion boards, video conferencing (with recording capability), and document sharing with team members. In terms of managing scalability, Canvas can maintain a class-wide discussion board where students can be divided into cohorts where a manageable number of teams can engage with one another to obtain feedback and reflect on the applied assignments. Canvas discussion boards also possess the ability to withhold access to other posts on the board until an initial posting is made. While this cannot guarantee team posts to the class are not influencing team decisions, it does require teams to first contribute their choices before reviewing other teams' choices.

Figure 2 outlines the adaptation of TBL to the online environment. The most critical aspect of TBL is its dependence on the sequence of activities being completed in a step-wise fashion to build upon individual and team learning processes. Specifically, individual learning precedes team application of learning concepts. In the face-to-face TBL model, these steps seamlessly occur in the class period allowing the instructor to facilitate team and class discussion in real-time and enable synchronous team discussion

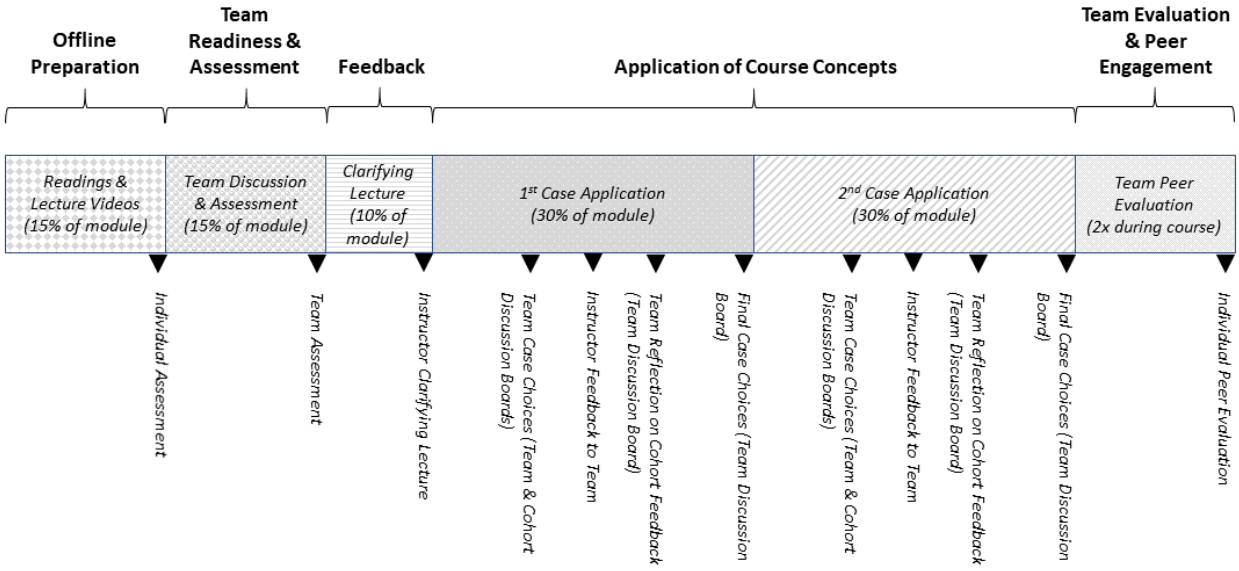


Figure 2. Overview of Online TBL Implementation

concerning their expertise and justification for choices made on the individual and team-based activities. Due to asynchronous time and leaner communication mediums, online TBL can be more difficult to manage. Rather, teams are given a window of availability to accomplish a task.

TBL begins with the creation of permanent teams composed of four to five randomly assigned students. Initially, teams were composed of five to seven students, but this proved challenging for scheduling team meetings. Team size was selected based on a need for teams to be large enough to allow for a variety of opinions, diversify student skills and assets, and mitigate the risks of social loafing or student withdrawal. Students were asked to create a team contract to address expectations for team member preparation and performance, meeting attendance, and individual responsibilities and roles. For example, teams were asked to identify two students each module to serve as team scribe who would be responsible for taking and archiving notes and a team leader who would be responsible for team submissions as well as coordinating meeting times. When courses became very large, five to six teams were grouped into cohorts for the application-oriented activities.

Each module incorporated multiple individual and team activities to implement the 4S framework. Figure 3 shows an example of the TBL structure as it appears to a student via the Canvas LMS for a module exploring the topic of software development. The learning objective for each module was twofold – to learn about the module topic and then apply its concepts using case analysis. Similar to the traditional TBL approach, students were asked to first work individually to familiarize themselves with the module concepts via textbook readings and lecture videos. Students would then complete the iRAT to ensure comprehension of the key module concepts prior to engaging with their teams. The iRAT was administered via Canvas and consisted of twenty multiple-choice questions about the module material, with fifty seconds allowed per question. Students were then asked to collaborate virtually with their respective teams on the tRAT to answer the same questions with the team leader submitting responses on behalf of the team. This process enhanced student readiness by giving the team an opportunity to reflect on questions individual students may have missed, enabling a peer learning opportunity. Timed quizzes were used to simulate the traditional classroom setting where students were constrained in their deliberation period and encouraged to form a consensus around a specific choice for each question.

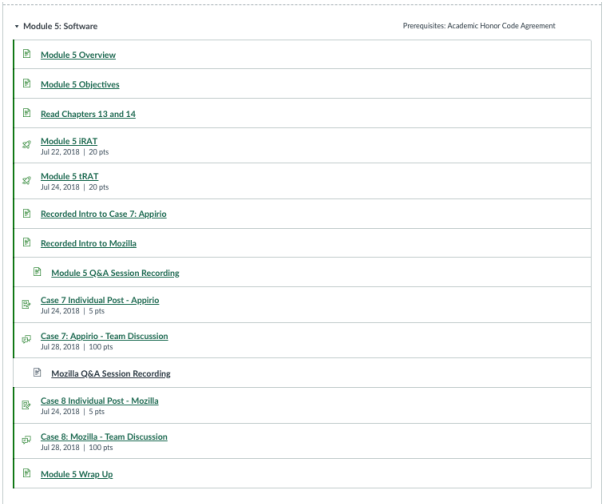


Figure 3. Online TBL Course Module Structure Example (Software Development Module)

To prevent free-riding, or students not preparing for the iRAT and relying on the tRAT, a rule was created that students must score at least a 60% on the iRAT to earn the tRAT score. Historically, the tRAT score was always higher than the 60% threshold. If a student failed to earn at least a 60% on the iRAT, the tRAT score was identical to the iRAT score. Additionally, each tRAT asked teams to identify all team members that meaningfully contributed to the completion of the tRAT. If a student was not listed, the student did not earn credit for the tRAT. By embedding this accountability component to the tRAT, students attempting to free-ride on the team's efforts were identified early and reminded of the team-based learning process and its benefits. Figures 4a and 4b show an example iRAT for the software development module and the identical tRAT with the additional accountability question asking to identify team members that participated in the tRAT activity.

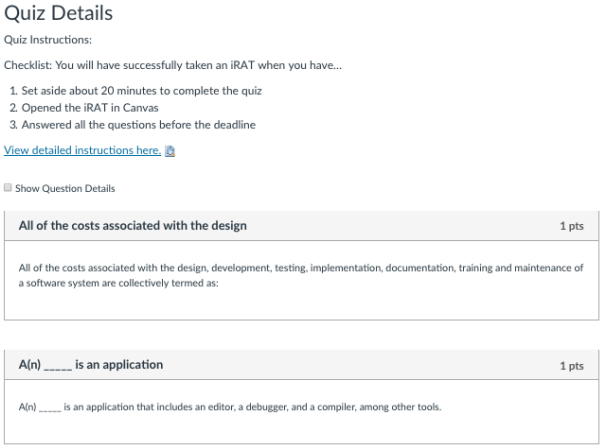


Figure 4a. iRat Example

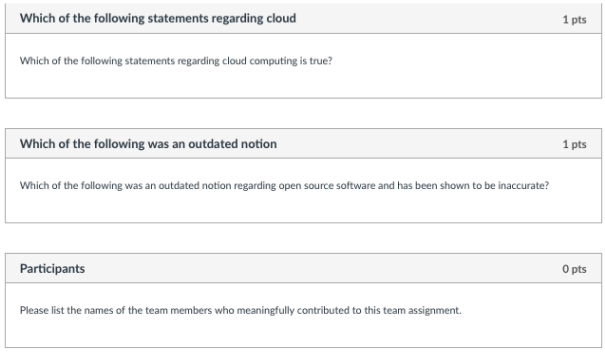


Figure 4b. tRat Example with Accountability Question

While Canvas possesses a comprehensive suite of tools for collaboration, teams were allowed to use alternative technologies (Google Docs, Google Hangouts, GoToMeeting, Skype, and WhatsApp, among others) if they felt the

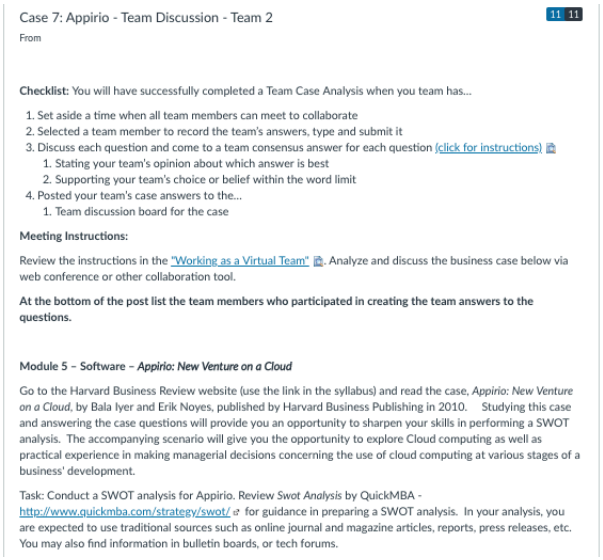
technology made the team more productive. The team scribe was asked to archive and provide a summary of the team collaboration regardless of the communication medium. Overall, the combination of the iRAT and tRAT allowed for meaningful team discussions with the assurance that every team member was prepared to collaborate and had a baseline understanding of the module concepts. This enabled the higher-level discussions during the application-oriented activities.

The instructor held a live virtual session that included a brief "concept clarity" session (termed "clarifying concept lecture") that identified potential class misunderstandings in module concepts based on tRAT scores. This session also provided an overview of the purpose and value of the application-oriented exercise (operationalized as case studies) in relation to the module topic. The session was recorded and posted to allow for asynchronous viewing by the class. In addition, the instructor used the live session for Q&A about the module topic and course administration to ensure students were aware of deadlines and class expectations.

Two case studies were assigned for each module to challenge teams to apply the module concepts to a business context. Consistent with the specific choice guiding principles of TBL, the case study assignments required teams to make specific business recommendations and to justify their recommendations in short answer format. Case study assignments helped teams hone their business acumen by requiring the synthesis of information, evaluating the relevance of the course concepts to the business problem, and gaining appreciation of the strength and weaknesses of the concepts as applied to a real-world scenario.

For example, Figures 5a and 5b show an example of the application-oriented activity, a case study: instructions for the software development module; and assignment questions that focus on the Strengths, Weaknesses, Opportunities, and Threats (SWOT) of a cloud computing organization. The pedagogical approach to the case studies builds upon the foundation of TBL where individual activity precedes team collaboration. Team members individually posted to the team discussion board with their initial case answers. Teams then created initial case answers based on their collective work that makes a specific choice and justifies that choice by synthesizing course concepts to the business case problem. The team leader posted the response to the team discussion board and the class (or cohort) discussion board to allow for students to comment and reflect on other team's responses to the case material.

The instructor provided feedback to each team's initial case answers. Teams then re-evaluated their response and submitted a final, team-based response. This final response also included a narrative that describes any justification for changes between the initial and final team response based on what they learned from the cohort. Each module included two cases that were completed sequentially. Figures 6a and 6b show an example of an initial team submission and subsequent instructor feedback concerning the software development module case on cloud computing. Teams would review the feedback and submit a final case submission with modifications and an explanation of the changes.



Case 7: Appirio - Team Discussion - Team 2

From

Checklist: You will have successfully completed a Team Case Analysis when you team has...

1. Set aside a time when all team members can meet to collaborate
2. Selected a team member to record the team's answers, type and submit it
3. Discuss each question and come to a team consensus answer for each question (click for instructions)
   1. Stating your team's opinion about which answer is best
   2. Supporting your team's choice or belief within the word limit
4. Posted your team's case answers to the...
   1. Team discussion board for the case

Meeting Instructions:

Review the instructions in the "Working as a Virtual Team". Analyze and discuss the business case below via web conference or other collaboration tool.

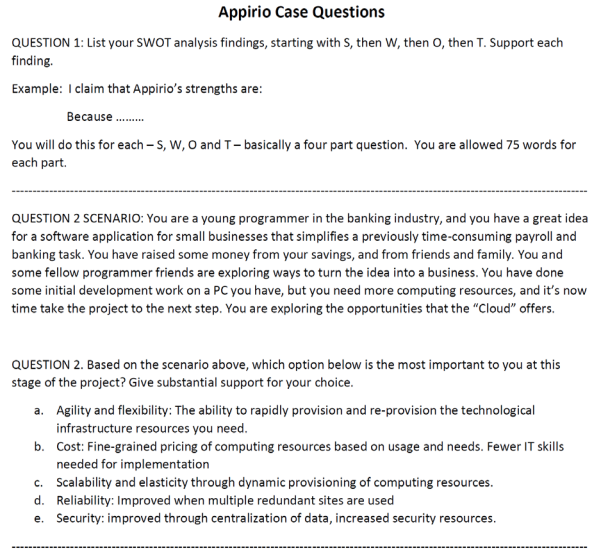
At the bottom of the post list the team members who participated in creating the team answers to the questions.

Module 5 – Software – *Appirio: New Venture on a Cloud*

Go to the Harvard Business Review website (use the link in the syllabus) and read the case, *Appirio: New Venture on a Cloud*, by Bala Iyer and Erik Noyes, published by Harvard Business Publishing in 2010. Studying this case and answering the case questions will provide you an opportunity to sharpen your skills in performing a SWOT analysis. The accompanying scenario will give you the opportunity to explore Cloud computing as well as practical experience in making managerial decisions concerning the use of cloud computing at various stages of a business' development.

Task: Conduct a SWOT analysis for Appirio. Review *Swot Analysis* by QuickMBA - http://www.quickmba.com/strategy/swot/ for guidance in preparing a SWOT analysis. In your analysis, you are expected to use traditional sources such as online journal and magazine articles, reports, press releases, etc. You may also find information in bulletin boards, or tech forums.

Figure 5a. Instructions



Appirio Case Questions

QUESTION 1: List your SWOT analysis findings, starting with S, then W, then O, then T. Support each finding.

Example: I claim that Appirio's strengths are:

Because .....

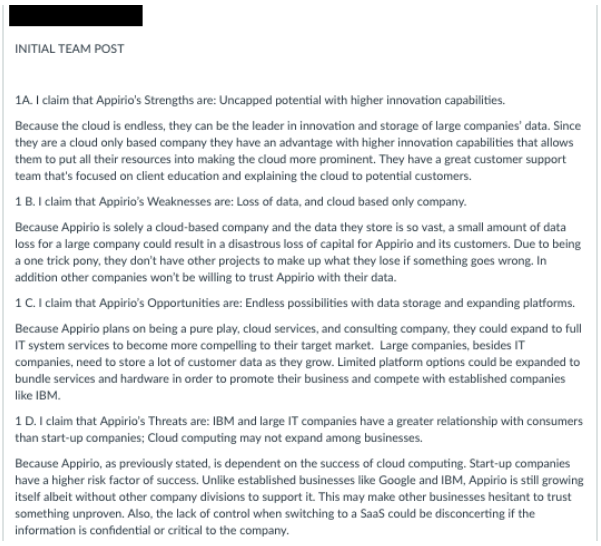
You will do this for each – S, W, O and T – basically a four part question. You are allowed 75 words for each part.

QUESTION 2 SCENARIO: You are a young programmer in the banking industry, and you have a great idea for a software application for small businesses that simplifies a previously time-consuming payroll and banking task. You have raised some money from your savings, and from friends and family. You and some fellow programmer friends are exploring ways to turn the idea into a business. You have done some initial development work on a PC you have, but you need more computing resources, and it's now time take the project to the next step. You are exploring the opportunities that the "Cloud" offers.

QUESTION 2. Based on the scenario above, which option below is the most important to you at this stage of the project? Give substantial support for your choice.

a. Agility and flexibility: The ability to rapidly provision and re-provision the technological infrastructure resources you need.
b. Cost: Fine-grained pricing of computing resources based on usage and needs. Fewer IT skills needed for implementation
c. Scalability and elasticity through dynamic provisioning of computing resources.
d. Reliability: Improved when multiple redundant sites are used
e. Security: improved through centralization of data, increased security resources.

Figure 5b. Sample Case Assignment



[redacted]

INITIAL TEAM POST

1A. I claim that Appirio's Strengths are: Uncapped potential with higher innovation capabilities.

Because the cloud is endless, they can be the leader in innovation and storage of large companies' data. Since they are a cloud only based company they have an advantage with higher innovation capabilities that allows them to put all their resources into making the cloud more prominent. They have a great customer support team that's focused on client education and explaining the cloud to potential customers.

1 B. I claim that Appirio's Weaknesses are: Loss of data, and cloud based only company.

Because Appirio is solely a cloud-based company and the data they store is so vast, a small amount of data loss for a large company could result in a disastrous loss of capital for Appirio and its customers. Due to being a one trick pony, they don't have other projects to make up what they lose if something goes wrong. In addition other companies won't be willing to trust Appirio with their data.

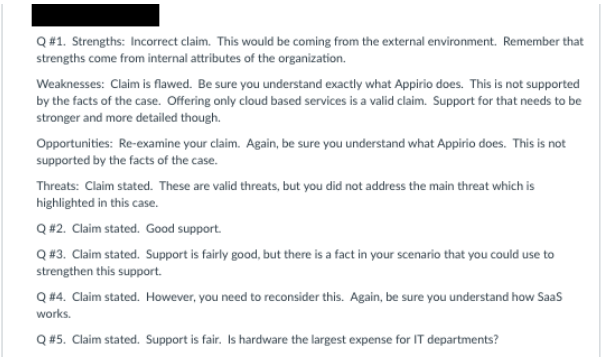
1 C. I claim that Appirio's Opportunities are: Endless possibilities with data storage and expanding platforms.

Because Appirio plans on being a pure play, cloud services, and consulting company, they could expand to full IT system services to become more compelling to their target market. Large companies, besides IT companies, need to store a lot of customer data as they grow. Limited platform options could be expanded to bundle services and hardware in order to promote their business and compete with established companies like IBM.

1 D. I claim that Appirio's Threats are: IBM and large IT companies have a greater relationship with consumers than start-up companies; Cloud computing may not expand among businesses.

Because Appirio, as previously stated, is dependent on the success of cloud computing. Start-up companies have a higher risk factor of success. Unlike established businesses like Google and IBM, Appirio is still growing itself albeit without other company divisions to support it. This may make other businesses hesitant to trust something unproven. Also, the lack of control when switching to a SaaS could be disconcerting if the information is confidential or critical to the company.

Figure 6a. Initial Case Submission



[redacted]

Q #1. Strengths: Incorrect claim. This would be coming from the external environment. Remember that strengths come from internal attributes of the organization.

Weaknesses: Claim is flawed. Be sure you understand exactly what Appirio does. This is not supported by the facts of the case. Offering only cloud based services is a valid claim. Support for that needs to be stronger and more detailed though.

Opportunities: Re-examine your claim. Again, be sure you understand what Appirio does. This is not supported by the facts of the case.

Threats: Claim stated. These are valid threats, but you did not address the main threat which is highlighted in this case.

Q #2. Claim stated. Good support.

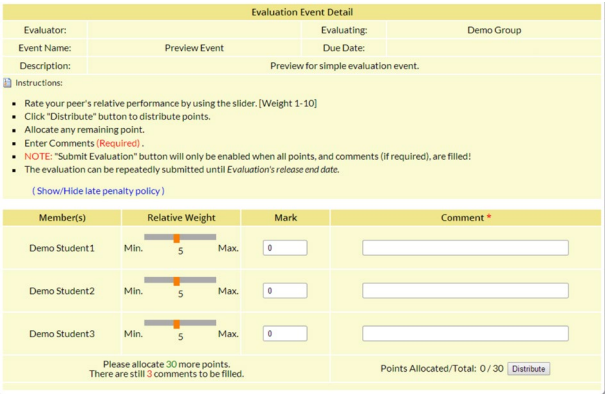
Q #3. Claim stated. Support is fairly good, but there is a fact in your scenario that you could use to strengthen this support.

Q #4. Claim stated. However, you need to reconsider this. Again, be sure you understand how SaaS works.

Q #5. Claim stated. Support is fair. Is hardware the largest expense for IT departments?

Figure 6b. Initial Instructor Feedback

In addition to the standard module learning activities, a peer evaluation on team member performance was conducted at two points during the course – the midpoint of the semester and the final module. The midpoint peer evaluation allowed the instructor to take corrective action for underperforming team members. Corrective action included positive reinforcement where the instructor would contact the team member and stress that the benefits of TBL hinged on their input. A follow-up reminder, if necessary, of the potential negative consequences of the peer evaluation component or other instructor sanctions usually sufficed. The adaptation of TBL to the online environment required several adjustments to adhere to the 4S framework. However, students were able to work on a significant problem, make a specific choice, and simultaneously report their findings in an asynchronous learning environment. Figure 7 shows an example of the peer evaluation using the iPeer for Canvas feature within the Canvas LMS.



Evaluation Event Detail

Evaluator:		Evaluating:	Demo Group
Event Name:	Preview Event	Due Date:	
Description:	Preview for simple evaluation event.		

Instructions:

- Rate your peer's relative performance by using the slider. [Weight 1-10]
- Click "Distribute" button to distribute points.
- Allocate any remaining point.
- Enter Comments (Required) .
- NOTE: "Submit Evaluation" button will only be enabled when all points, and comments (if required), are filled!
- The evaluation can be repeatedly submitted until *Evaluation's release end date.*

(Show/Hide late penalty policy)

Member(s)	Relative Weight	Mark	Comment *
Demo Student1	Min. 5 Max.	0	
Demo Student2	Min. 5 Max.	0	
Demo Student3	Min. 5 Max.	0	

Please allocate 30 more points.
There are still 3 comments to be filled.

Points Allocated/Total: 0 / 30 Distribute

Figure 7. Peer Evaluation in iPeer

3. OBSERVATIONS AND EVIDENCE

Overall, the approach was well received by students. From an instructor perspective, one of the first observations relates to the underlying flow of the TBL process and how it must be more proactively created in an online environment. TBL is ultimately a step-wise process where students progress from individual to team activities. In the face-to-face setting, all team members work simultaneously on a particular step of the process, allowing students to maintain focus as they move through the TBL process from individual preparation to iRAT to tRAT to team application-oriented activities. As a result, the process is seamless, and students can build on their understanding immediately. On the surface, the online approach appears similar to face-to-face TBL. However, the online environment accounts for the asynchronous learning environment by utilizing windows of availability to accomplish specific steps of the process. As a result, teams completing the work at the beginning of the window of availability experience a delay or slack time that requires the team to re-engage when the next step begins. The online TBL structure breaks the seamless flow experienced in the face-to-face environment across the different stages.

While the delay or slack time is useful to allow for the asynchronous nature of team coordination in the online environment, the break in flow means students must spend time re-familiarizing themselves with course concepts which can slow the team consensus building and learning experience. Combining this issue with the asynchronous coordination challenges of the online environment for completing team tasks means instructors must play a more active role to ensure students are maintaining a focus on the course material throughout the learning period and can readily re-engage with the course concepts. Essentially, we found that the "guide on the side" versus "sage on the stage" dichotomy is not as clearly distinct in the online setting.

In fact, both are needed to be deployed by the instructor to be effective in online TBL. The instructor needs to be a "guide on the side" with individual teams to ensure each team is progressing through the activities but must also be a "sage on the stage" to bring all teams back into the TBL process as the class shifts from one step to the next. The "sage on the stage" substitutes for the activities that occur seamlessly in the confines of the physical classroom setting where teams are focused on the specific course concepts and progress from one

activity to the next immediately versus the delays that occur in the online setting for teams to accomplish a task and await instructor feedback before proceeding further. By incorporating a "clarifying concept" lecture, the instructor carries the teams from the tRAT to the application-oriented activity stage. The Q&A and case introductions further oriented the teams concerning the activity purpose just-in-time for each team activity enabling the students to focus on the concepts and let the process unfold seamlessly through the instructor's guidance. Consequently, the flow aspect of TBL, which manifests naturally in the face-to-face environment, must be more proactively managed in the online environment and represents the single most challenging instructor issue for effective online TBL implementation.

In addition to the administrative aspect of TBL versus online TBL, a frequent observation was students sharing an initial degree of hesitation concerning the atypical approach to online learning. However, this was followed by the eventual conversion to the rewarding experience leading to a focus on understanding and conceptual learning. Students noted an improvement in absorbing the importance of technology in the business environment and the role technology will play in various business fields (marketing, accounting, and finance, among others), a course objective for the undergraduate introductory course. For instance, students noted how the content and format were beneficial to their learning experience:

> Very interesting course and at first, I was unsure as to the benefit, but in the end was very pleased with the amount of current and useful material studied and I feel more confident about the subject matter. I also have a better understanding of why accountants should be up to date on current events in all computer technology, not just accounting software.

> The format of the class was really interesting and took a lot of the tension away from merely making good grades and put the focus more on understanding and learning.

> This course was very beneficial for students, especially with the growth of technology. I've learned how to work better as a team, and I've improved my critical thinking skills.

The above quotes also highlight how online TBL helped shift student focus from academic performance to conceptual understanding and learning. On several occasions, it was noticeable how students were more interested in the application of course concepts and how the iRAT and tRAT, while critical to the learning activity, played a secondary role to the applied case activities where students saw course concepts "in action." In particular, students noted the improvement of their team skills and learning as a team, the goal of the QEP for university accreditation.

For information systems students, the use of online TBL also appears to enhance team skills that are essential for IS professionals. In the 2017 Society for Information Management (SIM) survey on IT trends and workforce needs, team skills are considered one of the most important soft skills to possess for IS professionals (Kappelman et al., 2018). As students progressed through the course, they and the instructor noted the improvement in team skills based on how work shifted from coordination of sub-tasks to collaboration through joint tasks and activities – a crucial difference between individuals working as members of a team and individuals synthesizing their collective expertise as a single work unit. Students frequently noted the team skill improvement qualitatively in course evaluation feedback, and the instructors noted the improvement in student performance over time as teams progressed through the course modules.

While several advantages to using online TBL were found, we observed several challenges. For instance, student interest in the online TBL approach was bimodal due to the belief by some students that online learning would be more individual-oriented rather than team-based. Students frequently cited the benefit of online courses being the ability to work at "one's own pace." For example, one student noted, "When you are having an online class, all students' schedules vary tremendously. This was not taken into consideration."

Purely from a learning perspective, students were spending approximately the same amount of effort and time to complete individual and team tasks compared to traditional "in class" contact hours. However, the added burden of coordinating team activities was frequently cited as a negative factor in their experience with the course. Students noted the challenge of coordinating multiple, virtual meetings to complete the tRAT and applied cases:

> This course required having nearly 2 conference calls per week and 3-7 emails out to the team. For the information introduced, this took too much time.

> The demand of the team assignments. I had to be in contact with my team almost every day of the semester. Too demanding for an online class.

Additionally, some students raised concerns about the impact of social loafing on team and individual performance. In particular, high performing students were concerned about being assigned to work with students that may not have the same academic goals or interest in exceling in a core curriculum required course. This issue frequently arose when teams experienced an individual failure in completing team tasks. Usually, the student not completing the task would ask to be punished individually to ensure team cohesion; however, sometimes the offending student would not make any attempt to take responsibility, frustrating the remaining team members: "The course weights should be changed to more reflect the efforts of each individual. Perhaps an odd number of cases to be assigned as a group, when even numbers are assigned to the individuals alone."

To mitigate this concern, three approaches were adopted through incremental modifications to the online TBL approach over the five-year period – accountability through tRAT meaningful contribution identification, the peer evaluation, and adjustments to the weights of the team and individual components. To reduce the impact of social loafing creating a burden for teams, students were offered the ability to identify social loafers during each module tRAT and early on in the semester so that the instructor could provide counseling to

modify student participation behavior. While some students did not adjust their behavior, the peer evaluation also allowed the instructor to adjust individual students' team grades based on a lack of participation. This provided students with a real-world experience associated with team evaluation that occurs in the workplace and how team members that underperform are managed. Lastly, the class was given the opportunity to collectively adjust the grade weights of the individual and team-based activities slightly to provide additional weight to individual assignments.

Accountability was critical to the success of team learning. Teams form when individuals "share the responsibility and reward (or penalty) for the outcomes of the team's work and recognize each other as members of the team" (O'Leary, Mortensen, and Woolley, 2011, pp. 463-464). At the beginning of the semester, an overview of the TBL approach was presented to the students along with a discussion on the differences between team and group collaboration. In particular, the concept of "divide and conquer" as a threat to effective team learning was identified. By emphasizing the importance of interactive engagement with course concepts among peers and the benefits of the TBL approach on overall learning outcomes, the instructor was able to create "buy in" from the students. In addition, closing the feedback loop between individual participation to the team, the team deliverable, and how individual contributions were synthesized into a team effort through instructor feedback at multiple points throughout each module reinforced the team aspect of the pedagogical approach.

Lastly, course administrative responsibilities create noticeable challenges for both the students and instructor. Early on in the development of this course, students frequently cited the confusion with the process for handling course assignments at the individual and team level in terms of submission times. The confusion lessened over time as Canvas allows for assignments to be added to the calendar feature to remind students of upcoming deadlines.

Surprisingly, one consequence of a team-based learning approach in an online course was that students felt the instructor was less engaged in their learning experience and cited the instructor's absence or abdication of leadership responsibility in the learning process. The TBL approach has high expectations for frequent interaction among team members to ensure the team learning process is successful. This same burden of high expectations is also applied to the instructor and his or her need to provide feedback in a detailed and timely manner in order to not disrupt or delay the sequential nature of TBL as mentioned earlier concerning the flow aspect of TBL. Even small deviations or delays can result in strong negative student feedback such as: "The most challenging part of this course was having an instructor who took a backseat. He, more than any student, was not engaged at any point of the semester."

In a traditional classroom setting, students can easily observe how an instructor is acting more as a "guide on the side" because the instructor is physically present and working amongst the teams during their team activities. However, it is more difficult to observe an instructor working with teams when a computer screen separates students from the instructor. Students only see the interactions between the instructor and their team and not how the instructor is engaged with all teams. Unfortunately, this can result in students feeling like an instructor has abdicated their role in any capacity as noted in the student comment above.

Lastly, students perceived that TBL requires more of a time commitment than a regular class because of the more frequent, consistent interactions required. These interactions create interdependencies that can be potentially disrupted when students are unable to contribute, sometimes for legitimate reasons (e.g., family or personal emergencies). One of the most challenging tasks was managing make-up work because of these interdependencies. To combat this, we elected to drop the lowest module grade which students found as equitable to both the student who missed the assignment and the team that had to complete work with a missing team member.

4. TEACHING SUGGESTIONS

Teaching with TBL in online learning environments can be successful provided instructors are careful in the design and application of the approach. Based on teaching with TBL online for the past several years, the following advice can aid instructors seeking to adopt this approach. Our suggestions stem from our initial adoption of online TBL, incremental changes made over the past five years that refine the approach and address challenges that emerged during our efforts, and additional suggestions that are being implemented or considered as online TBL gains wider attention from its community of scholars (e.g., Clark et al., 2018). In doing so, we present a series of critical success factors that are designed to support instructors seeking to adapt TBL to the online environment.

As with all projects, managing expectations is critical to success. For online TBL, the instructor must achieve "buy in" from the students in terms of the TBL approach and its time commitment which is challenging in an online environment. Tanner, Noser, and Totaro (2009) note students typically choose online courses due to the increased flexibility and ability to study at one's own pace which run counter to a team-based learning approach such as TBL. The implementation of the initial learning module that overviews the TBL approach and its benefits compared to more traditional online learning approaches was critical for students to understand the step-wise learning process and set appropriate expectations for student participation. Furthermore, the initial walkthrough module enabled students to experience the TBL process without penalty from assessing course concepts. This created a less stressful introduction to the course and its learning approach while also reinforcing the value of TBL to student learning.

To enhance buy in, instructors must positively reinforce team member engagement during each stage of the TBL process by continually stressing the benefits of TBL, i.e., not just one time at the start of the semester. We found the use of examples of exemplary teamwork provides recognition to high-performing teams, encouraging the highlighted team to continue as well as serving as an example to which other teams can aspire. In addition, our experiences were that students bought in more when they recognized that learning outcomes were improved (e.g., the tRAT score averages tended to be higher than the iRAT scores). Team members are

engaged when they trust and are held accountable to each other.

We also recommend finding ways to increase interaction to build on TBL concepts. For example, we experimented with the inclusion of an optional, live Q&A session to allow students to ask questions and walk through an initial module experience. Given the online environment, this session can be recorded and posted for students that are unable to attend at a specific time. The live Q&A was not included in our early iterations of the course, but we found its inclusion increased student interaction, served as an instructor touchpoint, and encouraged students to address concerns or deficiencies in their understanding of course concepts before applying them in the case activities. In future iterations of the course, we plan to extend this Q&A session to include the initial course introduction module that explains the TBL process and its benefits. When students are made more aware of the steps and dates associated with each phase of the TBL process, their understanding of the interdependencies in due dates helps them to be more efficient. Additionally, the reduction of student uncertainty gives them more confidence to jump in and participate right away, which we believe would allow students to focus on the learning objectives rather than the process.

Interaction with other students outside of their team could also be beneficial. One of the most cited concerns from students was the pace of feedback and its impediment from continuing the learning process. While instructor feedback was provided within a narrow window, the TBL Community of Practice (http://teambasedlearning.org) has been debating the potential value of "gallery walks" and peer feedback to potentially improve the efficiency in the feedback process. Besides allowing students to comment across teams or through utilizing the Peer Review function within the Canvas LMS, enabling features such as Discussion Board post liking could be utilized to help identify well-developed submissions or valuable feedback from peers. We believe this approach may be quite useful for managing the scalability challenges of online environments where increases in class size can substantially delay instructor feedback and create a significant disruption to the online TBL process for students.

Furthermore, instructors must connect each level of the process by establishing a link during the tRAT clarifying lectures through feedback to individual teams in a timely fashion and how the course material and applied case align with the course concepts and overarching goals of the course. We found that analyzing the tRAT submissions and looking for trends allowed instructors to identify patterns in course concept issues among teams and provide additional instructor materials to ensure teams could apply the concept to the case activities appropriately. Students appreciated the chance for additional feedback. For instance, students requested instructors provide the connective tissue between the cases and the course concepts using "short recorded lectures that introduce the importance of each case topic." Instructors can then facilitate discussions between the individual, team, and cohort levels to ensure students learn and apply the course concepts appropriately.

Additionally, TBL places expectations on the instructor as well to play an active, albeit different, role ensuring no delays are created due to the administration of the TBL approach which would detract from the student learning experience. As noted earlier, Figure 2 demonstrates the iterative process of TBL with feedback at several points within each module. Instructors must deliver timely feedback to students in a consistent fashion to not disrupt team coordination efforts. For instance, instructors frequently set a response timeframe for student emails in their syllabus and such a model could be useful in terms of establishing a feedback timeframe on which teams can depend when coordinating meetings or internal team deadlines.

The rapid back-and-forth requires a shorter but more frequent time commitment throughout the module rather than a larger, one-time effort. This means that the total time commitment per module does not vary compared to a traditional class, but how the time is spent matters. This is because the TBL process relies on the feedback loop from multiple levels (i.e., the team, the instructor, and the cohort) as a key component of enhancing learning.

As we noted earlier, online TBL effectively raises the bar on the level of expectations of instructors, having to both be the "sage on the stage" and the "guide on the side" simultaneously. These skills must be deployed at unique times to ensure the online TBL experience is seamless and students remain focused on the course concepts rather than the process. Ultimately, instructors must become "sherpas" that support their climber's ascent to the summit by knowing when and how to intervene when necessary and provide the guiding line to help the climber accomplish their goal (Rowland, 2018). In online TBL, the instructors intervene at the transition steps to keep the students aligned with the process but ultimately step aside to enable the students to make the climb and learn by doing (i.e., applying the course material with their teams).

While managing expectations is important to ensure students and instructors fully understand the administrative processes of the course, students also noted the negative impact of coordinating collaboration activities on their experience with online TBL. To mitigate these concerns, two techniques can be adopted. First, standardizing the team collaboration environment can reduce some decision-making steps for individual teams and coordination costs for the instructor. At first, students were given greater flexibility in the choices for how they completed team activities; however, this came with the added burden of documenting team activities so that the instructor can effectively evaluate participation. For instance, a team that adopted Google Hangouts as a personal preference for conducting team meetings required a team member to summarize the meeting and upload meeting minutes. Over time, we came to realize that the added flexibility can increase stress and add to the pressure of team-based learning in an online environment. By standardizing on the collaboration functions within the learning management system for teams, the instructor can provide guidelines and examples of team documentation needed for evaluating participation and allow the teams to focus more specifically on the course concepts rather than both the concepts and team administrative responsibilities.

Furthermore, the randomized selection of team members could be enhanced through pre-planning on the instructor's part for student availability to reduce coordination issues among team members. Identifying student preferences for availability and then randomly drawing from availability pools

to create teams would reduce issues associated with team coordination. Once assigned, teams should be required to hold a team kickoff meeting where the first deliverable is a team charter specifying student response expectations, course learning goals, and any information that may impact student availability. For instance, online courses enable students serving in the military to continue their education while on deployment. Sudden shifts in their availability arise and may impact availability occasionally. Identifying potential impacts allows students to develop contingencies and potentially lessen the negative feedback on peer evaluations when students must meet obligations outside their personal control.

5. CONCLUSIONS

Through several iterations over five years of teaching an introductory information systems course with online TBL, students were found to be highly engaged, focused on the application of course concepts, and built valuable virtual team collaboration skills. Such observations are consistent with prior literature that has found TBL as a valuable learning approach that students find effective, interesting, and enjoyable (Haberyan, 2007). Adapting TBL to an online setting requires properly structuring activities to reduce coordination costs associated with online teams and a seamless educational experience. The largest drawback to the use of online TBL was the split focus between course concepts and team processes associated with the implementation of TBL. These drawbacks can be mitigated through deliberate attention to managing student expectations, establishing a set feedback timeframe, and taking a nuanced approach to the creation of teams to account for the asynchronous and geographically dispersed student population. Based on instructor observations, this approach has been adopted in other higher-level undergraduate information systems major courses. Through the adoption of online TBL, students are empowered to take ownership over their learning experience, combine and synthesize the perspectives of a diverse set of opinions beyond their own, and develop a skill widely coveted in the business world.

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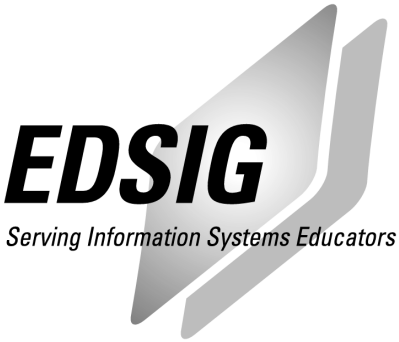

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