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Assisting Teams to Learn about Their Teams: Preliminary Experiences with Team-based Assessment Software in Face-to-Face and Online Teams

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ABSTRACT

Team dynamics, regardless of task complexity, challenge organizations. Learning institutions are the ideal environment for team learning experiences, and serve as a practice forum for a student's professional career. The objective of this paper is to describe the settings and outcomes of the adoption of a structured methodology and software application to support team learning. The research reports preliminary results from using Team Learning Assistant (TLA), a web-based team assessment system developed by Boston University's Center for Team Learning to carry out team interactions in face-to-face and distance learning classrooms. The TLA system was used to help the students structure their team experiences, and assist with problem-solving skills while also providing instructors with access to a web-driven database for peer assessment data capture and analysis. The pilot study placed emphasis on understanding team learning dynamics and student responses to specific tasks, including assessing their peers' performance. Peer assessment outcomes in online and face-to-face courses are compared. The results show that, on average, students' perceptions of their peers' leadership and task performance are higher in the face-to-face classroom. This finding may help instructors to increase efforts to better address leadership issues in virtual teamwork management.

Keywords (Required)

Team-based learning, assessment, peer evaluation, blended learning, online learning.

INTRODUCTION

Working in teams is one of the most complex endeavors for many organizations, particularly when team assessment is based only on product outcomes as often the case in for-profit environments. In a learning institution, students have the luxury to experiment with the process of working in teams by focusing on the actual learning process (rather than simply the project deliverable). The Team Learning Assistant, a Web-based team assessment system developed by Boston University's Center for Team Learning, is an application designed to help students structure their team experiences, while preparing for problem-solving skills that might benefit their future professional careers. It is also focused on assisting instructors from any discipline (who are not necessarily organizational behavior experts) to efficiently manage team learning. Prior studies (Wong et al,

2005) show that the structuring of team work helps reduce task-based and behavioral conflict, thus positively affecting the overall team effectiveness.

The Team Learning Assistant (TLA) system can be used both in regular face-to-face classes (as a supplemental online tool to organize and manage team tasks) as well as in distance learning courses (as a key repository of team interaction documents). Asynchronous learning networks (e.g., WebCT, Blackboard) serve as the delivery method for both courses. In this study, we present a brief review of fundamental social constructivism, collaborative learning theories and peer assessment methods embedded in the Team Learning Assistant system that emphasize the importance of conducting, managing, and assessing teamwork in various types of courses. We then describe the key areas of the Team Learning Process (Boston University Center for Team Learning, 2005), which was used in both online and face-to-face courses in a public technological university environment in the East Coast of the United States. We also discuss how TLA tools enable scaffolding for team learning through a structured step-by-step process that uses worksheets, reading assignments, teaching notes, surveys and progress monitoring tools. Finally we present preliminary findings on peer assessment results in face-to-face and distance learning courses and highlight some contributions.

OVERVIEW OF RELATED LITERATURE

Team-based learning is not a new pedagogical approach but one that stems from grounded educational theories. While much has been written on the value of team-based learning (Morgan and Aitken 2005, Steenkamp et al. 2005, Takeda and Johnson 2005), this paper refers to studies in the key areas that are relevant to our discussion on enhancing team-learning through peer assessment. In this section, we briefly introduce social constructivist theory, collaborative learning and peer assessment research that serves as the theoretical foundation for this research.

Social Constructivism

In the educational psychology field, traditional objectivists emphasize instructor-centered pedagogy. Mostly students act as a passive and independent learner by being isolated from their peers. By contrast, social constructivists believe that constructing meaningful knowledge occurs through social interactions (Derry 1999). Learning takes place when individuals interact with each other both socially and culturally. In other words, social constructivism theory holds the belief that social context impacts the nature and extent of learning (Gredler 1997). Students working in teams can not only learn from others, but also get an opportunity to incorporate the collective view of the entire team to construct deeper knowledge.

Collaborative Learning

One instructional model of social constructivism is collaborative learning. Due to the nature of social interactions among peers, collaborative learning often results in higher order learning compared to individual learning experience. Based upon an ethnographical field study on multimedia tools utilization, Goldman- Segall (1998) found that learners gain more knowledge by viewing different points of view from their peers. Schlechter (1990) found that collaborative learning generates more creative ideas and more diverse reasoning. A recent team-based learning study conducted via asynchronous learning networks (Gomez et al. 2007) reports that students working in teams throughout the whole semester perceived higher-order learning quality and enjoyment. In addition, this research also indicates that team members' contribution positively impacts individual learning experience. Through intensive team interactions, students also improved their team communications skills.

Peer Assessment

In professional organizations, assessment skills are essential, since professionals constantly need to assess their peers' work performance, the quality of products and also assess their peers. The assessment process involves what constructs excellent work. In other words, assessment requires more expert-like knowledge to judge other's work. Sluijsmans and Moerkerke (1999) found that peer assessment tools are effective for developing competencies required in professional organizations. Wu et al. (2004) reported that sharing and reading peer's work in a web-based participatory exam process broadened student understanding of specific subjects in an Information Systems course. Furthermore, grading peers' work in the participatory examinations also enhanced student assessment skills and helped them build expert-like knowledge.

In our current study, students working in teams utilized an online team assessment tool called Team Learning Assistant to practice *how to conduct structured team assessment* and how to effectively document and efficiently manage team activities to achieve common team goals. Through structured and explicit team setup criteria, students not only received an opportunity to effectively perform team tasks together but also practiced leadership skills. A key objective of this study is to identify whether the use of TLA to structure teamwork is more effective in face-to-face or in distance learning environments.

THE TECHNOLOGY: TEAM LEARNING ASSISTANT INTERFACE AND ITS SIX KEY AREAS

Team Learning Assistant (TLA) is a collaborative learning web-based tool to guide, organize, manage, and assess team performance. The TLA transfers collaborative learning theories and methodologies to a web-based environment, engaging the students in structured team activities (establishing a team contract, documenting meetings outcomes, providing feedback, conducting post-project evaluation reviews). From an instructor standpoint, it facilitates completing several team management tasks with a number of automated reporting tools. From a student standpoint, TLA scaffolds team activities, fosters conflict resolution, and makes students accountable to their peers.

The TLA system is accessible through a browser and no additional applets need to be installed on the client computers. It requires no overhead on the part of the adopting institution, as the web-system is hosted by McGraw-Hill (see TLA web implementations in Figure 1), and students purchase low-cost access codes (and materials) directly from the publisher.



Figure1: TLA Interface and Seamless Link From WebCT

The team learning assistant online interaction environment is organized in six key areas, each one focused on different steps of the team lifecycle (see Figure 2) completing a number of activities such as forming, storming, norming, performing and transforming activities.

Six key within the TLA online interaction environment include:

1. First Steps (Team Forming)
a. Teams are formed by instructor assignment of self-selection. TLA prompts teams to answer questions such as “How do we get started? What do we do now?” and presents introductory assignments such as reporting personal strengths and weaknesses, as well as listening and communication skills.
2. Team contracts (Team Storming)
a. Teams brainstorm on goals and expectations. They focus on questions such as “What are our goals? Do we have the same expectations of each other? How are we going to proceed?” and discuss stages of team building, team roles. They define and elaborate an agreement of tasks management and expectations by completing a “contractual” arrangement in the form of a work plan.
3. Team and meeting management (Team Norming)
a. Teams review rules and outcomes of meetings completed to solve specific tasks. They focus on issues such as “Why are our meetings so long? How can we resolve our differences?” and identify strategies for tracking meeting objectives through completing team checkpoints worksheets.
4. Peer Feedback (Team Performing)
a. This step is the core component of TLA which presents a structured approach to anonymously evaluating performance. Teams answer questions such as “How am I doing? How can we improve our work as a team?” and give and receive structured feedback through the completion of an on-line peer feedback worksheet.
5. After action review (Team Performing)
a. This step builds on the prior one and focuses on assessing learning progress. Team review questions such as “What course materials are we learning? What are we learning about team performance? How can we optimize both?” and focus on formative and summative evaluations as well as on modifying behaviors based on peer feedback.
6. Evaluation and closing (Team Transforming)
a. This is an important and often forgotten step which guarantees closure of activities and final team greetings and salutations. Teams focus on questions such as “We’re finished...how we say goodbye? How to we leverage what we learnt” and find strategies for team closure, including a final friendly outing and celebrations.

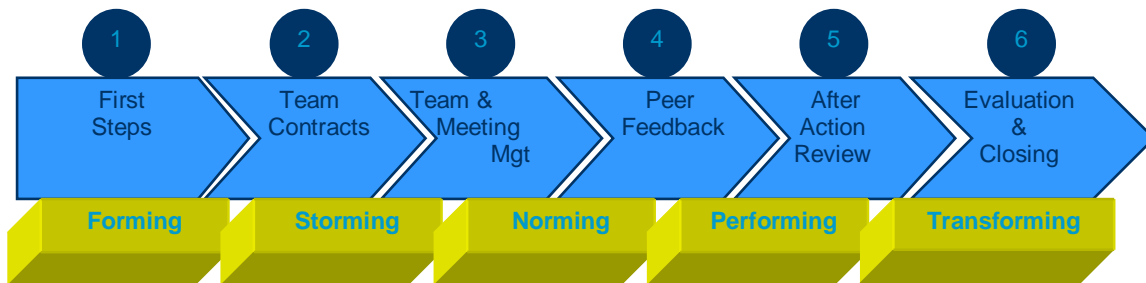


Figure 2: Team Learning Assistant 6-Key Areas

The structured and feedback-rich process is geared to empower teams with managing their expectations, as well as receive timely feedback by bringing forward actions to resolve conflicts. Through the TLA records, team members identify and discuss performance through the anonymous team feedback collected by the collaborative management system. Because work management “contracts” are agreed from the beginning and objectives are promptly made explicit, the software provides an interface to track performance against objectives, while making individuals more responsible for their own actions (or free-riding).

PEER FEEDBACK DATA COLLECTION AND RESULTS

Preliminary results from TLA implementation are presented from two management information systems undergraduate courses at a public research university. The pilot studies were focused on understanding team learning dynamics, student responses, and the overall impact on course quality. The lessons learned from the pilots may guide future restructuring of the

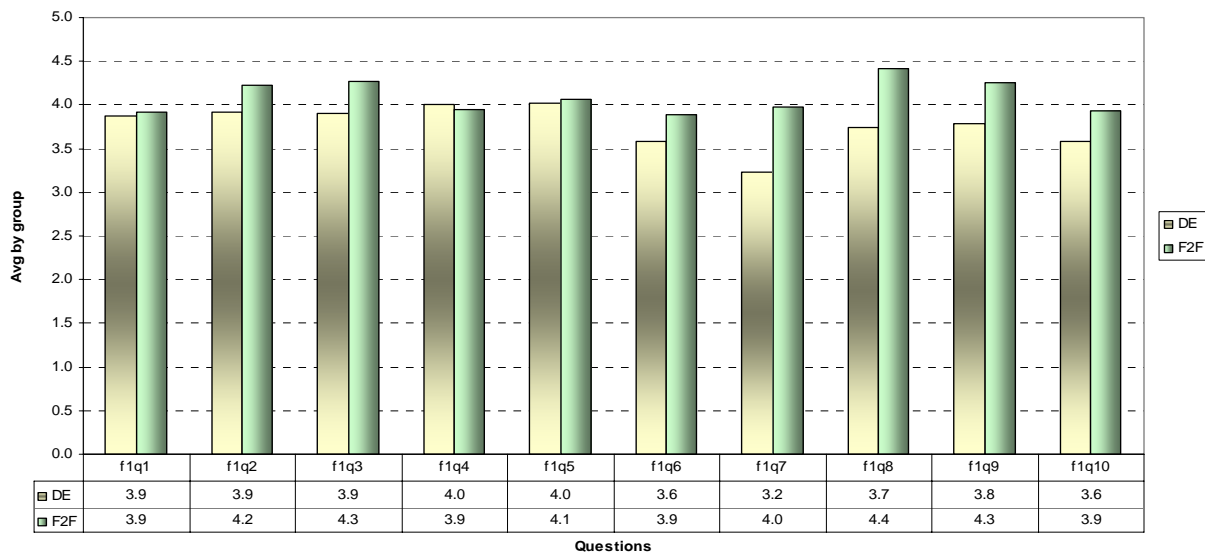
curriculum and team assessment tool design. Business Schools around the United States are increasingly being asked to report on mechanisms that are implemented to keep track of the achievement of learning outcomes. In such a context, the TLA environment of this study represents an important assessment tool to manage and evaluate interpersonal growth, a key learning outcome in any college program.

The TLA produces feedback reports and codifies individual and team achievement based on peer evaluation surveys of student perceived peer performance. Data was collected in two courses, one face-to-face (N=31) and one only online (N=34). Our objective was to identify perception differences of team contributions in the two learning environments. Since the courses had similar requirements and differed only in the interaction format (synchronous in-class team interactions versus online team interactions), we attempted to identify whether the TLA system appears more support of face-to-face or virtual teams.

In general, t-tests on the entire dataset confirm that, on average, overall perceptions of teammate performances on both tasks and leadership are higher for the teams that completed the face-to-face course ($t=3.308$; $df\ 18$, $p=0.004$, Mean F2F = 4.088 and Mean Online = 3.767). More details can be found in Table 1 and Figure 3.

	F2F	Online
Mean	4.088	3.767
Variance	0.035	0.059
Observations	10.000	10.000
Pooled Variance	0.047	
Hypothesized Mean Difference	0.000	
Df	18.000	
t Stat	3.306	
P(T<=t) one-tail	0.002	
t Critical one-tail	1.734	
P(T<=t) two-tail	0.004	
t Critical two-tail	2.101	

Table 1: Comparison of Overall Team Task and Leadership Performance for both Online and Face-to-Face Teams



Legend: f1q1= feedback 1, question 1; f1q2 = feedback 1, question 2; etc.
 F2F = face-to-face class; DE = Online class

Figure 3 – Face-to-Face (F2F) and Online (DE) Peer Evaluation Average Scores Comparisons

More specifically, using the TLA evaluation web-interface, team members evaluated their peers on task-related and leadership dimensions, based on the list of question is Table 2. These dimensions reflect the critical team performance areas

embedded in the TLA assessment software. While there are many other dimensions that are relevant to the evaluation of team performance (Blanchard and Thacker, 2006), TLA focuses on those which are more closely aligned to the task execution (task-related) and the interpersonal decision-making (leadership-related) given the temporary nature of the team interactions (semester-long courses). Results from t-test analyses show that while no statistically significant differences are associated with task performance in the two groups, the perception of leadership is statistically higher in the face-to-face teams.

Task-related Questions	Leadership-related Questions																																																																														
<p>Question 1: Shows initiative by doing research and analysis, takes on tasks.</p> <p>Question 2: Prepares for and attends scheduled meetings.</p> <p>Question 3: Makes positive contributions to meetings and helps team achieve objectives.</p> <p>Question 4: Reliably fulfills assignments and work is of high quality.</p> <p>Question 5: Contributes ideas to team's analysis and to my learning of course concepts.</p>	<p>Question 6: Keeps team focused on priorities.</p> <p>Question 7: Supports/coaches/encourages team members.</p> <p>Question 8: Listens carefully to contributions of others.</p> <p>Question 9: Manages conflict effectively.</p> <p>Question 10: Demonstrates effective leadership on the team.</p>																																																																														
<table border="1"> <thead> <tr> <th colspan="3">t-Test: Two-Sample Task Differences</th> </tr> <tr> <th></th> <th>F2F</th> <th>DE</th> </tr> </thead> <tbody> <tr> <td>Mean</td> <td>4.081</td> <td>3.946</td> </tr> <tr> <td>Variance</td> <td>0.026</td> <td>0.005</td> </tr> <tr> <td>Observations</td> <td>5.000</td> <td>5.000</td> </tr> <tr> <td>Pooled Variance</td> <td>0.015</td> <td></td> </tr> <tr> <td>Hypothesized Mean Difference</td> <td>0.000</td> <td></td> </tr> <tr> <td>df</td> <td>8.000</td> <td></td> </tr> <tr> <td>t Stat</td> <td>1.716</td> <td></td> </tr> <tr> <td>P(T<=t) one-tail</td> <td>0.062</td> <td></td> </tr> <tr> <td>t Critical one-tail</td> <td>1.860</td> <td></td> </tr> <tr> <td>P(T<=t) two-tail</td> <td>0.125</td> <td></td> </tr> <tr> <td>t Critical two-tail</td> <td>2.306</td> <td></td> </tr> </tbody> </table> <p>(not significant)</p>	t-Test: Two-Sample Task Differences				F2F	DE	Mean	4.081	3.946	Variance	0.026	0.005	Observations	5.000	5.000	Pooled Variance	0.015		Hypothesized Mean Difference	0.000		df	8.000		t Stat	1.716		P(T<=t) one-tail	0.062		t Critical one-tail	1.860		P(T<=t) two-tail	0.125		t Critical two-tail	2.306		<table border="1"> <thead> <tr> <th colspan="3">t-Test: Two-Sample Leadership</th> </tr> <tr> <th></th> <th>Variable 1</th> <th>Variable 2</th> </tr> </thead> <tbody> <tr> <td>Mean</td> <td>4.095</td> <td>3.588</td> </tr> <tr> <td>Variance</td> <td>0.052</td> <td>0.049</td> </tr> <tr> <td>Observations</td> <td>5.000</td> <td>5.000</td> </tr> <tr> <td>Pooled Variance</td> <td>0.050</td> <td></td> </tr> <tr> <td>Hypothesized Mean Difference</td> <td>0.000</td> <td></td> </tr> <tr> <td>df</td> <td>8.000</td> <td></td> </tr> <tr> <td>t Stat</td> <td>3.573</td> <td></td> </tr> <tr> <td>P(T<=t) one-tail</td> <td>0.004</td> <td></td> </tr> <tr> <td>t Critical one-tail</td> <td>1.860</td> <td></td> </tr> <tr> <td>P(T<=t) two-tail</td> <td>0.007</td> <td></td> </tr> <tr> <td>t Critical two-tail</td> <td>2.306</td> <td></td> </tr> </tbody> </table> <p>(significant)</p>	t-Test: Two-Sample Leadership				Variable 1	Variable 2	Mean	4.095	3.588	Variance	0.052	0.049	Observations	5.000	5.000	Pooled Variance	0.050		Hypothesized Mean Difference	0.000		df	8.000		t Stat	3.573		P(T<=t) one-tail	0.004		t Critical one-tail	1.860		P(T<=t) two-tail	0.007		t Critical two-tail	2.306	
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Table 2: TLA Peer Evaluation Dimensions and t-test differences

Results Discussion

In general, results are aligned with the expectation that face-to-face teams can easily take advantage of in-person interactions to facilitate their team activities scheduling. Distance education (DE) teams, which are connected online while they are physically isolated, have a tougher time in managing team activities. When online teams need to commit their team tasks, more additional communications must take place online. This requires more time and attention increasing cognitive overload. In particular, when team members experience difficulties and team conflicts, the online environment makes it even more time-consuming to resolve conflict issues and perform team tasks. For the face-to-face teams, team miscommunications seem to be resolved immediately, when they meet face-to-face. Immediate verbal feedback in face-to-face teams directs tasks more effectively and efficiently when compared to online text communications in online teams.

Leadership performance displays a dramatic difference between the face-to-face and the online learning environment, especially regarding the need for online team leaders to invest more efforts to establish explicit online team norms. Monitoring online team activities requires more time and attention for written communication. It appears more challenging for online team leaders to handle free riding issues and motivate their team members to contribute to their team goals. Face-to-face teams can easily meet together to clarify any potential team issues immediately. Therefore, online team leaders play a more critical role than in regular face-to-face teams and strategies to recognize the different requirements of online team leadership should be implemented accordingly.

It is also important to highlight some limitations of the study. In particular, we cannot attribute the difference among the courses solely to the use of the TLA software. Many other factors may have contributed to the behavioral outcomes. In this study, we only investigate the impact of one factor. Nevertheless, given the similarities among the courses (same materials, instructors and requirements), we can approximate that key differences in perceptions may also be due to the more limited impact that a software such as TLA may exercise on leadership when dealing with virtual teams.

CONTRIBUTIONS AND FUTURE RESEARCH

While the pilots were conducted in information system courses, it is expected that the examples are relevant to any discipline and program. Many multidisciplinary courses, but also specialized technical courses, adopt team based approaches. The TLA workbook and web-based system apply to any discipline that involves team collaboration as a portion of the learning experience. In addition, TLA offers customization options that enable using only certain features (and not the entire team lifecycle), if the proportion of team activities in a certain course is limited. Other institutions might find this tool as an optimal instrument for learning outcomes verification. It is an option that many schools could consider, particularly in distance learning environments. The results of this study may be especially useful in distance learning environments as they show that both face-to-face and virtual teams will seamlessly structure their work to complete deliverables (there are no significant differences in task perceptions), but perceptions of leadership vary by groups. Leadership behaviors are more difficult to emerge in a virtual environment. Recognizing that leadership styles may engage additional learning opportunities, instructors and researchers may leverage these results to identify mechanisms and strategies to boost the emergence of leadership styles in virtual teams.

We also plan to extend this research by replicating testing and data collection in other courses and at other universities. We are now at the stage of collecting more data from a variety of information systems courses such as systems analysis and design, electronic commerce etc. from both an East Coast Technical University and a Western Public University. We plan to incorporate more team factors beyond the TLA framework (e.g., team members' temporal perceptions, trust, and technology adoption behavior) to better understand team dynamics. The goal of future research is to provide insights on how to better design team assessment tools for both higher education sectors and professional organizations.

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