

Designing a Global Multi-Disciplinary Classroom: A Learning Experience in Supply Chain Logistics Management*

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Global competition has created multinational supply chains where raw materials production, marketing, and consumption can be in different countries in order to achieve cost-effective production and higher customer service levels by taking a systems approach to supply chain management. Therefore, a key to successful management is acquaintance with interdisciplinary multicultural environments, and with utilization of communication technologies. In this research, a global learning environment for industrial engineering and business students was designed, implemented, and evaluated.

Keywords: global learning, supply chain management, global teams, case study.

INTRODUCTION AND MOTIVATION

A GLOBAL PARADIGM in the marketplace has become popular as well as necessary. Being able to function with global team members within a complex global society has been added to the roster of current marketplace requirements for hiring employees [1]. This has been supported by a survey among USA companies, which rank global orientation as the second major factor to be considered [2]. Results of the survey revealed that executives being surveyed hoped that to have distinctive competency, the development of such an orientation should occur within five years, which translates to our current time. This pursuit from the marketplace has put pressure on educational institutions to prepare their graduates with intercultural knowledge and competence, and to transform them into productive and responsible ‘world citizens’ [3].

Considering the global context of current and future companies, an interest in supply chain networks and logistics activities is growing, both in industry as well as in academia. Globalization has resulted in complex multinational supply chains where each stage of the supply chain takes

place in a different country in order to maximize the global system-wide benefits for all players. The nature of the problems encountered are global and requires so-called ‘world citizens,’ who can interact with team members from diverse cultures and employ modern communication technologies [4]. Case oriented pedagogy with globalization focus creates an environment that students can flourish to an extent conventional education cannot offer [5]. As pointed out by Sclater, et al. [6], more value-added can be created by changing students’ attitudes in developing various skills and abilities to develop global competencies. To achieve this, global teams are considered to be a fixture of this pedagogy [7]. We, as in the business of education, call for the responsibility of preparing business and engineering graduates in global supply chain and logistics contexts as one way to address the development of global orientation during their formal education. The benefit of having world class graduates equipped with global supply chain management concepts and skills is being able to better define the weakest links in a supply chain network, improve them in conjunction with differential cultural impacts and backgrounds, and thus achieve global efficiencies within the chain, resulting in a win-win situation.

With this perspective in mind, our goal was to design an environment for global learning in

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teaching a logistics and supply chain course, where students would be required to team up with other students from overseas and utilize the World Wide Web to solve real-life global logistics problems. In addition to learning about the fundamental knowledge of the subject, the global nature of this course aims to improve students' understanding of their national differences and thus increase the scope as well as scale of their knowledge in the proposed area. Thus, our work falls in the third-generation approaches category identified by Bufardi, et al. [8]. We generally focus on social, contextual, and pedagogical dimensions by developing a collaborative environment, discussing advanced educational concepts, and addressing social interactions.

The organization of this paper is as follows: first, we present a definition of global learning. Then, we define the deliverables that are required for the global learning environment. Next, we discuss results from our surveys that were designed to evaluate expected outcomes. We conclude with lessons learned and recommendations.

GLOBAL LEARNING

Considering historical evolution, globalization is not a relatively new process, but it is rather unique in its time. It has been developing distinction as the result of 'intensification consciousness,' as described by Robertson [9] or 'awareness,' as defined by Waters [10], on any arrangements among the citizens of world. In an educational setting, globalization has been viewed and adopted into the visions or missions of many universities in order to position students among global citizens [11]. The expected role of students as global citizens is to perform a success-driven function across different interdependent cultures and societies. This understanding is totally different from the earlier, nearly historical approach to globalization, which was termed 'internationalization', and sometimes defined as 'crossing national boundaries' [12]. The evolutionary difference between global learning education and internationalized education lies in the visional shift of the 'off-shore' and 'on-shore' approaches in education [13]. The major drawback of off-shore and on-shore approaches to internationalization is the possibility of the nostalgic for the cultural separateness as opposed to 'complex connectivity' [14]. Global learning is intended to eliminate the need for these approaches, given that the current advances in web-based communication technologies have already blurred the distinction between the two approaches. As pointed out by Burbules and Callister [15], however, we suggest that 'global learning' is not confused with 'distance education.'

Global learning requires an initial breakthrough change, followed by continuous improvements in course design to restate learning expectations, including the activities in which to be involved and the assessment to measure outcomes. Thus,

global learning is defined as a combination of global reach, through modern communication technologies, and global perspectives, through interaction with learners and faculty of diverse cultures, to produce the global graduate [16]. In this process, technology is the infrastructure that enables the global reach and creates an environment where global perspectives can flourish. The role of faculty in the global process is to facilitate learning via certain instructional strategies that must tackle stereotypes and exotica issues; encourage examination of multiple perspectives; avoid the simplification of other cultures; minimize the ignorance of global issues; focus on power, discrimination, and injustice; and promote a cross-cultural experience [17]. Thus, faculty should collaboratively bring multiple but collective issues to the global discussion table and expose the world's students, via virtual teams, to discussion of the overlap of economics, politics, culture, and technology. Multiple cultural meanings and experiences are inescapable duties for team members in this process [18]. Qureshi and Vogel [19] develop a model of organizational challenges mapped against processes of adaptation in order to highlight principle factors affecting virtual teams.

The movement toward global learning suggests that its importance has been well understood by both academia and practitioners. However, discussion in the literature is on the challenges and strategies. In order to focus on our objective in this paper, we refer the reader to Marginson and Mallis [12] for the challenges of global learning, and to Rimmington [16] for the determinants for successfully overcoming these challenges.

The practice of having interdisciplinary students from distant parts of the world to work on a common case or a project in a class setting is not new. Relevant applications in both nationwide [20] and global [21, 22] operating environments exist. Using the analogy given by Lee [23], the global learning movement has passed the substitution effect, and currently the scaling effect is taking place. Most published studies support this scaling effect. Prolific examples report promising benefits at both the individual level [24, 25] and institutional level [24, 26]. A structural effect has not been finalized and is in the developmental stage. Although our work is an example of the scaling effect, it is unique because of the following:

1. Course design in each involved institutional unit is content-wise distinct but project-wise mutual.
2. Although we focus on global teams in our discussion, we consider both control (local teams) and treatment groups (global teams); global team members will never meet face-to-face, from the initial to the final reporting stages.
3. While the design stage is sponsored by a Boeing Global Learning grant, the implementation is not monetarily sponsored by any agent or school.

4. Only free resources were utilized for communication.

From an assessment point of view, we administer pre- and post-surveys in order to evaluate the success of the application and to provide analysis regarding the change in students' perception due to their experiences in global learning. Finally, we leave the reader with the most valuable lessons learned.

DELIVERABLES

Institutional units involved

The units involved in this study were from three colleges of two universities:

- decision sciences (FREDS) in the Barton School of Business at Wichita State University (WSU), USA;
- industrial and manufacturing engineering (IMFGE) in the College of Engineering at Wichita State University, USA;
- industrial engineering in the Faculty of Engineering and Natural Sciences (FENS) at Sabanci University (SU), Turkey.

The faculty in these three units were fully committed without any reservations and highly enthusiastic about global learning applications. Both universities have global learning centers, suggesting the opportunity and support provided by higher administration.

Course schedule, design and materials

This global learning experimentation was performed during Spring Semester 2004. The spring semester at WSU begins around mid-January and ends around mid-May. At Sabanci University, it begins around mid-February and ends around mid-June. The one-week spring break at WSU and SU occurs around mid-March and mid-April, respectively.

The supply chain courses in the above-mentioned units were content-wise distinct but project-wise mutual. Each instructor followed his or her own design in delivering the content. It was our deliberate action not to create a learner-centric environment, that is, allowing students from different cultures to manipulate the content. The other reason for such a distinct structure in allowing the instructors to manipulate the content was the lack of consensus existing in the literature about the role of the instructors in such web-based teaching [27]. The courses, however, were designed to have two common global cases from Harvard Business School (HBS), which were inspired by real-life industrial applications of supply chain and logistics management. This created a skill-development-centric environment, which supported our objectives in this research.

Since the content delivery system in each class was independently designed, we allowed each

institutional unit to follow a different book, as follows:

- FREDS: 'Supply Chain Management: Strategy, Planning, and Operation,' second edition, 2004, by S. Chopra and P. Meindl, Prentice Hall, New Jersey.
- IMFGE: 'Business Logistics Management,' fourth edition, 1999, by R.H. Ballou, Prentice Hall, New Jersey.
- FENS: 'Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies,' second edition, 2003, by D. Simchi-Levi, P. Kaminsky, and E. Simchi-Levi, McGraw-Hill, Irvin, New York, NY.

All three units utilized business case studies as part of their instruction. The two common cases used as case studies for this global learning project were:

- Sport Obermeyer Ltd.; Hammond, Janice H.; Raman, Ananth; HBS Publishing; 10/13/1994
- Applichem (A); Flaherty, Marie-Therese; HBS Publishing; 02/22/1985

Students were required to analyze the case, submit a final report, and make a presentation to defend their approach. In the first case study, the objectives were clearly given. Students knew which questions they should address. However, the second case study contained no guidelines. Students were asked to develop some problems that they should analyze and provide alternative solutions. We thought that in a real case, it would be the job of the logistics and supply chain team to identify the problems and then propose solutions for a given situation.

Students and team formation

A total of 47 students from three units were involved in this study, the demographics of which are listed in Table 1. The supply chain courses offered at all three units were elective to the students. IMFGE students were second-year graduate students, from India and with little work experience but having some mechanical engineering background. FREDS students were Americans pursuing an MBA, with non-technical backgrounds and having some work experience. FENS students were all Turkish, pursuing towards MS degrees in industrial engineering with minimal work experience.

Table 1. The demographics of the students in the study

	FENS	IMFGE	FREDS
Nationality	26 Turkish	12 Indian	15 American
Gender	10 female 16 males	8 males 4 females	2 female 11 males
Age (mean/variance)	23.5 / 2.08	27.12 / 4.39	30.67 / 1.54
HBD Model			
Problem	12	5	4
Result	8	1	4
People	4	2	3
Action	2	—	2

To better study and analyze the common cases, students were grouped into teams. In order to evaluate the success of the global teams, we set aside a few control teams (CT) in each institutional unit. Each team consisted of maximum four students. Out of a total of 14 teams, 10 were control groups (six in FENS, three in FREDS, and one in IMFGE). The other four groups were formed by students from different institutions and referred to as global learning teams (GLTs). Each GLT was composed of one American student from FREDS and one Indian student from IMFGE at Wichita State University, and two Turkish students, one female and one male, from FENS at Sabanci University. The process for GLTs was important because we wanted to avoid having teams composed of all engineers, or all business students, or all females or males. We labeled this variety as 'scope in background.' Team members with no scope in background, say all engineers, tend to see every problem as a number-crunching exercise, while those with a full scope in background will include all aspects of a problem and learn from each other [28]. Moreover, when students were assigned to teams we pay attention to their personality orientation relative to the Hermann's Brain Dominance (HBD) four-quadrant model [29].

In this model, each person possesses a different set of dominant personalities in accordance with where thinking in the brain is taking place, resulting in four different personality types: right cerebral quadrant (action-oriented personality), left cerebral quadrant (problem-oriented personality), right limbic quadrant (people-oriented personality), and left limbic quadrant (result-oriented personality). Since we are using this model as a guide, we refer the reader to Lumsdaine and Lumsdaine [30] for the details of the four-quadrant brain model. In our study, we labeled the existence of variety in personality as 'scope in orientation.' To determine these orientations, we administered the test provided by Kanet and Barut [28] to each student enrolled in three units at the beginning of the semester, prior to team formation. Table 1 provides the distribution of personality orientations for each institution.

The same process of team formation was used for both control and treatment groups. Homogeneous teams were formed by assigning students with a common personality orientation. In other words, all members in these teams were from the same personality type. If all members used the same brain quadrant to think, it was expected that they would attack every problem with the single-directional procedure, thus yielding to no conflict of interest among the members. On the other hand, heterogeneous teams, composed of members from different personality types, were expected to demonstrate proliferated procedural approaches to the problem at hand, and thus, may yield to lack of efficiencies. In assigning team members to either homogeneous or heterogeneous

teams, the conflict, if any, in 'scope in background' was resolved by looking at the person's second dominant personality. This process was used with only two students. As a result of this process, five of the 11 control teams and two of the four global learning teams were homogeneous. With the limited number of students, in one of the homogeneous groups, the team members were all problem oriented, and in the other, all of them were result oriented.

Infrastructure

The Blackboard learning system was utilized to deliver the service product bundle. Both CT and GLT groups benefited from the blend of services and functions provided by Blackboard. This learning platform was basically used for content management, and synchronous and asynchronous group discussion management. For teleconferencing and videoconferencing purposes, Yahoo! Messenger, which is one of the best and most flexible, fee-free instant messengers [31] that allows multiple members to concurrently meet in a conference room with voice and video opportunities, was chosen for the group meetings. Hence, the global teams were not expecting any problems in communication, especially during videoconferences.

For presentations, we planned to utilize the Media Resource Center (MRC) at WSU and a similar setup at SU to communicate and make presentations. The software utilized was IP-to-IP Polycom. In case of emergencies that might exist due to firewalls at universities, Polycom ViaVideo webcam for video and any other messenger for audio were planned to be used, in place of the professional system.

SURVEY DESIGN

Before students enrolled in the GL part of the logistics and supply chain project, we asked the entire student body to take a survey, which can be obtained from the corresponding author upon request. In the first part of the survey, we asked about their demographic/background information including major, sex, age, department, and GPA, and if they had any international travel experience and friends from other cultures. The second part of the survey was designed to measure students' attitudes toward several factors:

1. *Other cultures*: considering the students' country background (Turkey, USA, and India), the questionnaire was designed to obtain information on their perception of these countries' social systems, cultures, and ideas and practices.
2. *Global learning*: we tried to identify what students would expect from a global learning experience if they participated. The objective was to see if a global learning experience would

make a difference in terms of students' skills in teamwork, applied knowledge, knowledge on global understanding, and tolerance to diversity and different cultures.

3. *Technology*: the intention was to acquire students' skills and comfort levels in technology usage. Since technology is a required part of the infrastructure, it has a moderating impact on the success. We were expecting that multi-media technology would enhance students' experiences in oral, visual, and written communication.

We aimed to explore students' prior status on these issues and then compare the results of their positions on the same issues afterward. Thus, after the class was completed, the GL team members retook the survey. In the second part of the survey, the students were asked to provide their opinion on the above-mentioned constructs, using a seven-point scale, ranging from 'one' for 'strongly disagree' or 'not at all' to 'seven' for 'strongly agree' or 'to a very great extent.' In order to determine the direction and polarization of student perceptions, paired t-test scores comparing pre- and post-values to test whether the expectations were met or exceeded. Next, we discuss the survey results and report any changes in views and skills.

DISCUSSION OF SURVEY RESULTS

Cultural impact of global learning

Students were asked to express their level of agreement or disagreement about whether the global learning experience would improve their understanding of tolerance of diversity, different cultures, and the extent to which they were comfortable in dealing with 'world citizens' of different countries. The scores, on a one-to-seven (strongly disagree-to-strongly agree) scale, were averaged and are shown in Table 2. Overall, regardless of nationality, statistical analysis suggests that the expectation of the benefits and realization was significantly high, with a p-value of 0.01 compared to the neutral score of 4. However, the paired sample t-test scores for each premise for any column category in the table indicate that the afterward change in average scores was not significant, meaning that the students were still holding the same level of benefit expectation justifying the cultural importance of global learning. As expected, the means test for the results also

revealed that American students already have the highest degree of comfort in dealing with people from different countries. American students, however, thought that a global learning experience in education via technology would not make any difference in terms of such premises as 'tolerance of diversity' and 'understanding of different cultures'. This might be due to being exposed to different cultures during the education system as well as at work place. Both Indian and Turkish students were more optimistic than American students in terms of expectations from global learning, particularly in terms of 'tolerance of diversity' and 'understanding of different cultures,' while expressing a lower degree of initial 'comfort with different cultures'. Students from both nationalities reported that they had become more comfortable after the global learning experience via technology in this class.

Pedagogical impact of global learning

In the pre-study statistical analysis, overall comparisons made between the control and global groups suggested no significant (with $p < 5\%$) perceptual differences across nationalities toward the expected benefits from global learning. This was an important actual result, supporting the procedure followed in appointing students to global and control groups, whereby without loss of generality, the control group became a benchmark for any changes for the global group after exposure to the global learning experience. Table 3 summarizes the average scores for both pre- and post-survey results. Note that bolded scores represent a significant difference compared to a neutral answer at p value of less than 0.05. Considering a scale of one to seven ('not at all' to 'a very great extent'), on the average, regardless of control and global teams, the level of 'current experience in global learning' was about 2.3, which is to a very little extent. The post analysis on the global group shows that this score went up to 5.69, suggesting a considerable, almost triple, improvement in experience, which made a difference among the students. Overall paired-sample t-tests revealed that there is a significant ($p < 0.01$) difference after the study in response to the question regarding students' 'current experience in global learning'. Results also revealed that even though students had a very low experience in global learning, they held a high positive perception (5.0 on the average), and this perception increased (5.46) after the class experience.

Table 2. Cultural premises results for global learning

Premise	American		Indian		Turkish		Combined	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Tolerance of diversity	4.50	4.50	6.25	5.75	6.00	5.63	5.69	5.38
Understanding of different cultures	4.25	5.00	6.25	6.00	6.13	5.25	5.69	5.38
Comfort with different cultures	6.50	6.75	5.75	6.25	5.50	6.00	5.81	6.31

Furthermore, students were asked to rate two additional premises, as listed in Table 3, relevant to their current status and/or expectations on global learning as pedagogy. All students involved in the global learning reported that the extent of their perception about global learning increased, from 5.00 to 5.46 on the average. They also justified their thinking that the global learning experience would help them gain knowledge. The difference was not statistically significant to conclude that their pre- and post-thoughts about the global theme was different. On the other hand, across nationalities, the analysis suggests that while the Indian and Turkish students improved their experience much more than the American students, the positive perception of the Turks about global learning was not as significantly high as both Americans' and Indians' perceptions. Indians seemed to have gained the most from their global learning, compared to Americans and Turks.

When students were asked to express the degree of agreement on a scale of one to seven (strongly disagree to strongly agree) about whether their global learning experience would improve their skills in teamwork, applied knowledge, and global understanding, their responses, as shown in Table 4, indicate that on the average, the post-experiment responses were less optimistic compared to the expectations of the students before the study. Students' expectations were not as strong as their pre-experiment perceptions for 'applied knowledge' and 'global understanding', even though they still expected that global learning would be significantly beneficial (compared to a neutral score of four) in terms of any such premises as listed in the table, except those in bold. Although many more improvements were expected, the results for these premises were not a surprise. We are still convinced that once potential technological problems are well factored into the course design stage, the expected benefits for each premise would be materialized.

The other reason why Americans did not think that global learning in a class setting might not contribute to teamwork skill development was due to the fact that all of them were working in primarily global companies having a vast amount of experience in project teamwork; therefore, it is understandable that they may not have high expectations. However, post-responses from American students also indicated that they improved on 'teamwork' skills using technology. It seems that the time constraint did not allow American students to exploit as much as expected on sharing 'applied knowledge'. The change in their response to expectations in terms of 'applied knowledge' were statistically significant with $p < 0.01$. The same was true for Turkish students in that the reduction of expectations was significant with $p < 0.05$. Despite the low transactions on 'applied knowledge', Indians seemed to have the most optimistic expectations and realization of improvement in all three premises.

In terms of pedagogical impact of 'scope in orientation' practice during the team formation, although heterogeneous groups used more variety in techniques for problem solving, we did not have statistical evidence at $p=0.05$ to make distinction between heterogeneous and homogeneous groups in terms of case analysis quality. Number of groups for 'scope in orientation' was also not enough to append further statistical analysis in this matter.

Technological impact of global learning

Students in global teams were also asked to rate their experience in technology usage, specifically in virtual chatting, webcam usage, and videoconferencing, to indicate their communication skill development expectations from global learning and to specify their comfort level in oral, visual, and written communication via technology. The average results are provided in Table 5. Note that while the scale for the first technological premise is one to seven (strongly disagree to strongly agree) with a neutral point of four, the scale for the rest is one

Table 3. Premises results for global learning as pedagogy

Premise	American		Indian		Turkish		Combined	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Current experience in global learning	2.75	5.00	2.75	6.25	2.00	6.40	2.38	5.69
Positive Perception for GL	5.00	6.00	4.00	6.25	5.50	5.20	5.00	5.46
Expectation from GL in gaining knowledge	4.75	5.00	6.50	6.5	5.88	5.00	5.75	5.46

Table 4. Premises results for global learning on teamwork, applied knowledge, and global understanding

Premise	American		Indian		Turkish		Combined	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Teamwork	4.50	5.00	5.75	6.25	6.00	5.88	5.56	5.75
Applied knowledge	5.25	4.00	5.50	6.00	5.75	4.38	5.56	4.69
Global understanding	5.50	4.75	6.50	6.25	6.50	5.38	6.25	5.44

Table 5. Technological premises results for global learning

Premise	American		Indian		Turkish		Combined	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Communication	5.00	5.00	6.75	6.25	6.38	5.63	6.13	5.63
Comfort with technology	4.75	4.75	6.00	6.50	5.13	5.60	5.25	5.62
Virtual chatting	2.50	5.25	5.50	6.5	4.38	6.50	4.19	6.19
Web cam usage	2.50	4.50	4.75	6.75	2.88	6.50	3.25	6.06
Video conferencing	2.25	4.50	2.50	5.00	2.38	5.75	2.38	5.25

to seven (not at all to a very great extent). For communication skill via technology, average results of the survey indicated that although the expectations and realizations were significantly higher compared to the neutral point of four, no statistical significance was found between pre- and post-responses. Based on the means test, American students seemed to have less expectation than Indian and Turkish students of improving communication skills via technology during a semester-length global experience. In terms of comfort with technology, a statistical difference exists among students from different nationalities. Students from India showed the highest level of comfort in technology, followed by students from Turkey and then students from the United States. While the initial level of comfort in oral, visual, and written communication among students from Turkey and the USA did not show a statistical difference, the post-realization suggests that Turkish students gained more skills than American students.

The last three premises in Table 5 suggest that the higher the level of involvement in virtual chatting, webcam usage, and videoconferencing, the higher the level of comfort with technology. Regardless of nationality, all students significantly improved their experience in these areas. Based on the means test, however, both the initial and improved experience levels show a descending pattern as we move from Indian, to Turkish, to American students. Post-study results reveal that American students gained significantly less technological experience in this learning environment, which might be due to working full-time and having difficulties in arranging virtual meetings because of the significant time differences between countries. Differences in the post-experience level between Turkish and Indian students were not statistically significant. Though we may conclude that Turkish students benefited the most from this global learning experience, with the lack of a sample size, we do not have the statistical evidence to claim that students from different nationalities are different in their affinities to communication technologies. Even though none of the students believed that they had significant experience on videoconferencing, obviously they felt more competent after the global learning experience. Recall that the pre-experiment study revealed the fact that students believed they had significantly low experience with videoconferencing. From the

above discussion, we can conclude that statistical evidence shows that all students, regardless of their nationalities, significantly improved their initial experience in all three premises.

LESSONS LEARNED

To search for something better, much can be learned to improve the design and implementation of such an environment. Based on our personal experiences as a group of instructors and on our students' first-hand experiences, we would like to comment on the following important issues that might be critical for success.

Cases must induce global thinking!

We found that our decision to discuss the second case was important. Although some student groups complained about lack of objectives in handling the case, the application induced more global thinking. Compared to the first case discussions and solutions, the second case drew more challenging discussions and variety in identifying issues and customizing the handling of bottlenecks. One important factor that helped students build confidence in their solutions is that we, the three instructors involved in this experiment, suspended our traditional role with them and promoted learning rather than teaching. Each group was able to identify all important issues in the case and provide 'good quality' solutions using different tools. While one group approached problems from a purely strategic managerial perspective, another group was free to use an engineering approach with mathematical modeling. Thus, we believe that the instructor should not insist on what we believe to be the 'right' answer. Rather, group members should be challenged with problem definitions and methodology identifications in order to induce global thinking. In this approach, we found that group members learned from each other and were often convinced by a student member who recommended using a particular technique. When one business student approached us and asked whether or not to use a mathematical technique suggested by an industrial engineering student, our role was to facilitate and encourage students to challenge their group mates to convince them. Later on, the business student commented that he was so happy to learn the Lagrangian

relaxation technique that he never knew before and to be able to use it in solving the problem. Similarly, most of the industrial engineering students indicated their appreciation for being introduced to strategic perspectives from business students. Using the results of the mathematical formulations and incorporating management aspects into the optimization models generated multiple approaches and recommendations. In the case of increased animosity and lack of communication among the team members, the global team must be supervised and students must be advised to integrate and consolidate their efforts.

Time horizon and management must be effective!

When time differences between countries are considerable, managing meeting times becomes difficult. For example, when full-time working members in the USA leave work, it is 1.30 AM in the morning in Turkey. Considering eight hours difference between countries and given that all American business students were working full time, it was an extremely difficult task for them to get involved in team work during the weekdays. As a result, most of the groups opted to have a general meeting on the weekends when they discussed the tasks to be done by each team member. During the week, groups of two or three students usually met to discuss the case study. Minutes of the meetings were made available to the rest of the group members by using Blackboard. When managed properly, however, group members were also aware that somebody was potentially continuously working on the project for 16 to 18 hours due to the eight-hour time difference. On the other hand, feedback from the Turkish students indicated that the time they invested in solving the case studies as a global team was not more than the time that they would have spent if they were doing this case study locally.

Another important issue was the difference in beginning and ending of semesters in each country. A one-month difference between the start of semesters made it almost impossible to have a case study early in the semester, especially for SU students, since the amount of knowledgeable material covered in the course was not vast enough to start working on a case study. To solve this problem, the start times of the cases were delayed. However, this led to other problems such as global learning teams at other institutions having to study the first case over spring break. The due date of the second case study was very close to the end of the spring semester at WSU. As a result, the WSU global students felt tremendous pressure because of their other projects and finals. Instructors must keep in mind that priorities of students among the institutions may cause disruptions. A consensus to delay the due date by one week was reached.

Improved team work process is a must!

One student commented as follows: *'If any member chooses to stay out of the project, it's very*

hard to get hold of the person. One should develop a way to hold all students accountable for at the very least minimal participation.' With the teamwork design in this experiment, we did not require a leadership position. One way or another, we believed each group would find the best way to function, following one of the motivational theories. Although peer evaluation was required and individual performances were realized and factored in students' case grades, concern about members' active participation was still present. Traditional group member behavior existed in global learning groups as well. As indicated by another student: *'I had a great experience about team work. I learned how hard it can be to communicate and work if there is a person not willing to participate in team work. Managing people is hard and needs patience.'* One way to manage people is to assign leadership and secretary tasks to group members, and rotate these tasks as students move from one case to another. Another way is to introduce students to problem-based learning, as described by [28], and clarify the process. With this approach, each team would have a leader, who would be in charge and keep the meetings focused, and a secretary, who would detain the meeting minutes in a formal format that would be an agenda-setting document for consequent meetings.

Multiple curriculums helps the scope of knowledge!

Content-wise distinction in teaching helped to improve students' scope of knowledge. In local teams, although time management allows them to dispense with extra meetings and spend more time brainstorming, since the students are taking the same course and learning the same content from the same instructor, the scope of their knowledge relative to that of students in global learning is limited. In fact, some group case reports with inferior solutions were observed. Having different backgrounds, studying in different universities, and following a different curriculum by different instructors using different textbooks enabled students to brainstorm different ideas and solution methods, and to incorporate various perspectives in solving case studies. This design was the intention of all instructors and led to learning from peers. However, the incentive for a student who ends up teaching his or her peers most of the time must be made clear.

Free resource is subject to low quality!

Recall that one of our objectives was to use a free resource only for group videoconferencing. The universities' professional videoconferencing rooms were used for presentations of the results only to all global students groups. For group videoconferencing, students chose to use Yahoo! Messenger. The problem students faced was that as the number of students joined the videoconferencing, most of the time, voice and video quality deteriorated. Moreover, some technical problems, primarily due to firewalls and with getting the

audio and video to work simultaneously were additional factors. In such cases, group videoconferencing was downgraded to virtual chatting. Students' feedback suggested that having a better way of communicating over the videoconferencing would definitely increase success. It was also apparent that Yahoo! Messenger lacks an equation editor that students can have access to during videoconferencing. Students have difficulty switching back and forth between the Blackboard virtual room that allows the use of equation editor and white board and Yahoo! Messenger. This complaint was expected, but usage of such a tool was not encouraged.

Login to the Blackboard 6 Course Management System was primarily a problem for Turkish students. This forced the groups to exchange files via email in addition to utilizing Blackboard's file-exchange feature. Although problems were created mostly from firewalls, solving them was time consuming and not easy. Avoiding the usage was easier than fixing the problem since time was important.

CONCLUSION

In this paper, we presented the design of a multidisciplinary classroom where students in various nations form global teams to study and

examine global cases on the topic of supply chain management. In this design, we discussed deliverables, including the institutional units involved, course materials, team formations, and infrastructure. We administered a survey questionnaire before and after to examine the change in participants' perceptions against different cultures, global learning, and technology. Students in each group interacted with each other via videoconferencing, primarily using Yahoo! Messenger, exchanged knowledge, and obtained solutions for the cases on hand. Survey findings were encouraging in the sense that students' perceptions of the importance of global learning were very high and even rose after the experience. This is important since globalization with the aide of technology reduced the whole world to a small village. Companies are global in nature and require 'world citizens' to operate at all levels. Survey results revealed that unless students are involved in such global experiences, they are reluctant to use sophisticated technologies. Usage of web conferencing technologies tremendously increased after the semester. Overall, students believed that this kind of global rendering is definitely helping to improve their global knowledge in multiple dimensions. Finally, we concluded by sharing the lessons learned throughout this experience with suggestions on how to overcome some of the problems.

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