

# Using Groupware in a Classroom Environment

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## Abstract

As the use of project teams and work groups continues to grow, employers are beginning to value and to recruit those students who understand how to perform well in groups. This interest creates the logical opportunity to introduce both the concepts and practical applications of groupware (Group Supports Systems (GSS), Group Decision Support Systems (GDSS) and Electronic Meeting Systems (EMS)) into business school courses. This introduction provides students with the conceptual understanding, basic skills and fundamental knowledge about working and being productive in teams. This article describes several tips on how to use groupware in a classroom to help meet this demand for team-oriented education.

*Keywords:* Active learning, business education, GDSS, groupware, teaching tips

## 1. INTRODUCTION

Organizations are moving more and more toward team and group based work. Derived from this movement is the requirement for a new set of skills. Effective team work requires enhanced personal communications and creative problem solving skills as well as new skills such as the ability to work in groups, the capacity to integrate knowledge across several functional areas and "the ability to maintain productive user/client relationships" (Trauth et al. 1993). Since all of these skills relate to the ability to work effectively in teams, software tools and environments that support groups and teams, generically called groupware, are playing an increasingly important role in business, and, as a result, in business school curricula. In response, business schools are looking to change their education delivery paradigm (Barr and Tagg 1995) and are being more aggressive in including problem solving, innovation and creativity (Couger 1996) in curricula. For example, Barr

and Tagg (1995) identified a gap between academia's "espoused theory" and academia's "theory in use." Essentially, when the espoused theory (the idea of teaching more real-world business concepts) was compared to the theory in use (what was being done by business schools), a noticeable gap appeared.

An American Assembly of Collegiate Schools of Business (AACSB) report (Porter and McKibbin 1988) studied business schools and their graduates. Ultimately, the results indicated that there was too little emphasis in the following areas: people skills; communication skills; creative problem solving; the importance of the external environment; the global aspects of business; and business ethics. Even in disciplines where people skills may seem de-emphasized (e.g., Information Systems), prospective employers rank the need to maintain good user/client relationships first (Trauth et al. 1993). The results of another study (Louis 1990) paralleled those of the AACSB study with MBA students five years after

their graduation. Here, more than half of the MBAs felt that they lacked the necessary people skills for their current jobs and two-thirds believed that their business school backgrounds had not prepared them for the realities of working within an organization. In a survey comparing student and recruiter perceptions of career skills, Martz and Landof (2000) found that recruiters ranked team skills in the top three of "most desirable skills for graduates over the next three years." More significantly, the recruiters surveyed placed team skills among the skills needed for career advancement.

Many business schools have responded to these complaints and concerns by changing their programs to provide more active, experiential learning opportunities for their students (Greising 1989). Higher education in general and business schools in particular are moving toward more participatory and collaborative methods of instruction. Between 1980 and 1989, the number of colleges and universities using more collaborative learning techniques grew from 100 to 450 (Greising 1989). Also, more recent reports indicate that students should be actively involved and engaged to facilitate the learning process (Goodsell et al. 1992; Graham 1992; Johnson et al. 1991; Light 1992; Nicastro and Jones 1994).

New active learning methods such as learning centered education (Bilimoria and Wheeler 1995) are being formulated and concepts such as student learning environments (Chickering and Gamson 1987; AAHE 1996) are being implemented (Corbitt et al. 1999; Martz et al. 1999). Specifically, these papers present a list of desirable characteristics for quality instruction including: active learning; assessment and prompt feedback; collaboration and integrating education with experience. These methods and implementations attempt to transform students from passive receptacles to be filled with knowledge by an expert instructor into involved participants who are helping to construct their own knowledge. Some of the active learning methods used most often in business schools include: case study discussions; cooperative learning projects; simulations; group exercises plus in-class discussion; and structured controversy (conflict resolution).

The active learning techniques are not without problems, however. In general, the concerns center on the efficiency and effectiveness of collaborative group efforts within the traditional class curriculum. While there seems to be a need to increase the number of group activities and to offer more opportunities for students to be actively engaged, the same barriers that plague team efforts in the workplace exist in the

traditional classroom as well. A number of authors have documented these drawbacks in typical work group environments; those that relate most directly to the classroom situation include: air fragmentation - or who gets to talk first and/or next (Nunamaker et al. 1991); interpersonal barriers like dominance, hidden agendas, conflicting goals among participants, socializing and free riding (Nunamaker et al. 1991; Shockley-Zalabak 1991); time-consuming activities related to getting all ideas out or offering all students the opportunity to talk within a 50-75 minute timeframe (Fox 1987); fear of negative evaluation (by classmates or the teacher), which may inhibit some students (Nunamaker et al. 1991).

## **2. EVOLUTION OF GROUPWARE**

Over the last fifteen years, groupware has been called many names. The term refers to the broad area of computer software designed to support the basic processes undertaken by groups. One can find many sub-classifications of groupware. For example, the 1994 issue of *PC Magazine's* feature article, "The Changing Office," listed three main categories and over 20 sub-categories of groupware and catalogued over 80 commercial products available at that time (Ayre and Gottesman 1994). One of the categories defined by *PC Magazine* was Electronic Meetings Systems (EMS). Since that time this area has expanded beyond the face-to-face environment implied by EMS. Today, terms such as Group Support Systems (GSS), Group Decision Support Systems (GDSS) or Collaborative Group Technology (CGT) are used to acknowledge the fact that there are no temporal or geographical limits on how groupware can be used to support group work.

The central compelling theme within all of these categories is that the software technology is designed to enhance the productivity of groups; similar to the way that electronic spreadsheets and word processors enhance the productivity of individuals. We believe groupware responds well to the characteristics requested of a student learning environment. Used correctly, groupware creates an active learning environment; provides students the opportunity to see the practical application of technology to complete group assignments; enhances the student experience to group assignments; and ultimately, students leave the university better prepared to meet the group and team-oriented needs of their future employers. In addition, research has shown that groupware technologies may

<b>Module</b>	<b>Description</b>	<b>Salient Characteristics</b>
Electronic Brainstorming (EBS)	This module is based on Osborn's (1953) and Whiting's (1958) work with the manual methodology called Brainwriting. In the manual method, each participant is provided a separate sheet of paper on which to place his or her first thoughts about the topic under discussion. The participants exchange sheets and respond again; this time with the "first" thought from someone else helping in the prompt. This process continues until the facilitator stops the process. Electronic Brainstorming is an electronic version of this process.	Levels of anonymity (complete, alias); very divergent process; geared toward getting a wide set of information on a single topic.
Topic Commenter & Group Outliner	Topic Commenter and its logical counterpart, Group Outliner, were patterned after processes such as 5-M method (IBM 1989). In this problem-solving methodology, participants focus on predefined areas such as Money, Material, Manpower, Mechanisms, and Management. By changing the predefined areas, many structured group productivity methodologies such as de Bono's (1985) Plus, Minus, Interesting; Advantage/Disadvantage (VanGundy 1984); Cause and Effect diagrams (Ishikawa 1988); and Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis can be supported and demonstrated.	Topics are predefined to help focus group members; collects comments in real-time; provides a multi-channel approach to collecting information; Group Outliner works on multiple levels while Topic Commenter uses a single level.
Categorizer	This module was developed to allow the group to sort and categorize a list of ideas. The list of ideas could come from a previously executed tool like EBS or TC or it could be created within the tool. While the software could provide the participants the ability to sort the ideas, the process is usually helped by a facilitator performing the editing of the list while being directed by the participants. Organizing methodologies like the Nominal Group Technique; Hoshin Planning (King 1989); and SWOT can be supported.	Organizing list is created by the participants as part of meeting; Participants relate their interpretations and assumptions about how the list topics "cluster" or group; deals with the difficult convergence process of problem solving.
Vote	This module allows the participants to vote on a list of topics in many ways. Voting methods supported include rank order, rating, true-false, Likert scale (predefined and user defined) and allocation (Tull and Hawkins 1980).	Simple point and click interface; produces basic individual and group-level consensus statistics

Table 1. Overview of GroupSystems Modules

have "strong and practical classroom value" (Money 1998) and that groupware can eliminate/reduce some of the "dysfunctions" of groups in business and in the classroom (Briggs et al. 1998; Fjermestad and Hiltz 1999). The objective of this paper is to provide experience-based tips for using groupware in a business school curriculum.

The next section describes a list of eleven practical uses of groupware that the authors have experience with in the classroom. The groupware used here is Ventana's (now GroupSystems.com) GroupSystems software. While the module names are used in the discussion, Table 1 below provides a summary description of the software modules. These module descriptions enable the reader to understand the generic problem solving methodology that is being supported and should help the reader identify and find similar software if they are

planning to incorporate a specific teaching tip.

### **3. APPLICATION OF GROUPWARE IN A BUSINESS SCHOOL ENVIRONMENT**

#### **Application: Class Introduction**

GOAL: Introduce members of class and instructor at beginning of course.

MODULE USED: Topic Commenter

Many instructors ask students to introduce themselves or fill-out information cards (e.g., 3x5 index cards) in the first class to expedite the process of getting to know their students. In classes that will involve group projects, it is also very important for students to get to know each other. However, individual introductions provide only limited information and are extremely

time-consuming for larger classes. While students can provide more information on the cards, that information is only available to the teacher. A simple use of groupware is to have students use it to provide information such as email address, phone, courses taken, work experience and even photos. The groupware module, Topic Commenter, allows the instructor to build an "electronic card" for each student to fill out. Once collected in the groupware system, each set of results can be displayed or posted to a webpage. This "class directory" is then available to all students and can be used to jump-start introductions or can be distributed to all as a contact list for use throughout the semester. Additional information can also be added to serve as an ice-breaker for the class.

The notion of an ice-breaker to introduce members of a class can be just as effective as introducing members of a business team. One possible ice-breaker is to have students tell something unique about themselves. Another example of such an activity is "two truths and a lie." This process has each class member providing three facts about themselves on the "electronic cards" with two being true and one being a lie. Determining the "untruth" provides an interesting and fun environment to learn about the members of the class.

#### **Application: Just-in-Time Class Agendas**

GOAL: Optimize use of actual class time to student needs.

MODULE USED: Vote

Instead of the "one-size-fits-all" class agendas, groupware can be configured to create "just-in-time" class agendas more tailored to student needs. For example, students come into the class and are presented with a short quiz on the chapter. The quiz isn't graded but instead is a way for the class to let the instructor know how to maximize the limited class lecture time. The results of the quiz provide insight as to what the students know and indicate for the instructor what topics to cover or what topics to start with in the lecture. Assume the assigned chapter covers 10 topics. The instructor would create a question or two for each topic and the students would answer those questions. For the sake of time it is better if the questions can be multiple choice or true/false. The system immediately grades all the quizzes and displays the results to the instructor. The instructor now has a much clearer understanding of where the class is concerning the lecture material. A variation on this is to just list the topics that are important from the chapter, and have the students respond with a number from 1 (don't know or understand the topic) to 10 (would be bored covering

this topic again) indicating their level of understanding for that topic. This method is quicker as the students have less to do (i.e. rate 10-15 topics), but does not test to see if they really understand a topic. Obviously it is possible for a student to incorrectly think they know a topic and this method does not test that.

The intent of the exercise is to give the instructor and students as much quality lecture time as possible by eliminating the need to cover some of the topics; in theory, the ones with which the class is most comfortable. Even if topics are not eliminated from the lecture, the instructor has a good starting point for the lecture. By first covering those topics that are least understood by the class, the instructor maximizes the potential for knowledge acquisition by the students.

#### **Application: Student Evaluation Criteria**

GOAL: Create student involvement and "buy-in" with course grading criteria.

MODULES USED: Categorizer; Vote

Most instructors establish a set of firm grading criteria that they will use to evaluate students before a course begins. This exercise presents an alternative wherein students use the groupware to determine the course grading criteria. This exercise which is usually presented during the first class period and is an excellent way to foster student buy-in and participation in the class. The instructor begins the exercise by explaining each of the different grading methodologies (i.e. quizzes, homework, projects, midterm/final, class participation) to the class. Using the Categorizer module, the students are then given about 10 minutes to discuss the pros/cons of each grading criteria. At the end of the 10 minutes, the students use the Vote module to decide which set of grading criteria will be used in the class. Note that some instructors do not feel comfortable giving the class this much influence over the grading criteria. Until the instructor gets comfortable with this, they can assign one grading criterion and let the students choose some others. For example, the instructor can say "We will have a quiz every four weeks. Now the class will get to decide on two more criteria for determining student grades". If the class decides on a project and class participation, the final grading criteria will be quizzes, a project and class participation.

Extending this exercise further, the class can decide on the weighting of each criterion. In this case, the voting tool is used. The final criteria are listed, and each student is given 100 points to allocate among the

criteria. In the above example, the students might allocate 50 points to the quiz, 25 points to the project, and 25 points to class participation. If these numbers turn out to be the averages, it would imply that 50% of the students grade will come from quiz scores, 25% from the project score and 25% from class participation. This process has also been used to determine the grading criteria for group projects. The students can determine such things as how much to take off for spelling/grammar errors, late submission, incorrect cites, etc. Overall, the students seem to be much tougher on themselves than the instructor is.

**Application: Real-Time Team Testing**

GOAL: Provide testing environment with real-time feedback.

MODULES USED: Topic Commenter

The traditional and accepted method for evaluating students is individual exams where students respond to a series of test questions. One of the more interesting groupware applications attempted is that of team-based exams. In a team-based exam, each student in a team of five or six is asked to complete an open-ended discussion question. The questions are encoded into and recorded by the groupware software. Each student then opens the assigned question and responds. A second pass is initiated where each student opens a second question, reads the original student response and comments. Under the guidelines of the test, the second student may agree or disagree with the original answer but must explain his or her new response. The final phase of the team-based exam asks the whole team to look at each set of original and secondary responses, and to discuss them verbally with the instructor as a class.

Initial reactions to the team-based exams have been positive. Students get immediate feedback; not necessarily grades, but a reaction to their answers from instructors and peers. Students are provided multiple methods to communicate and relate their knowledge on a subject. The instructor now has three levels of student response by which to establish a grade: the classic historical response; a secondary critical response; and verbal interaction in the final phase. In this scenario, anonymity must be disabled as individual grades need to be assessed.

**Application: Electronic Discussions**

GOAL: Promote environment that encourages class discussion.

MODULE USED: Electronic Brainstorming

Class discussion is a teaching technique that is utilized in nearly all business school courses. Students discuss films, articles, books, lecture content and other discipline-specific topics. Typically the instructor has a list of questions that he or she poses to the class, to which various students respond. Even more typically, only the most prepared and/or the most outspoken students participate actively in the discussion. Unless the instructor is particularly skilled at drawing out the less vocal students, most class discussions are dominated by the same few students each time. Electronic discussions using a groupware product help equalize group input (Benbasat and Lim 1993; Gallupe et al. 1991), since every student has the same opportunity to offer ideas, opinions or criticisms.

The groupware environment adds strategically different characteristics to the student's learning environment: both benefits and drawbacks. First, after starting the session, the instructor has the opportunity to become an anonymous participant and may act as an unobtrusive catalyst in the discussion. Second, because all comments are anonymous, students cannot distinguish which comments come from the teacher and which are from fellow students. This anonymity attribute of electronic discussions has two supporting advantages: it equalizes input for all involved; and it discourages students from "talking" to impress the teacher when they may not actually have much to add to the discussion. Finally, one confound with complete anonymity is that the teacher is not aware of who participates most and has little way to assess individual students' preparation for the discussion.

Complete anonymity is not the only mode in which to run this activity. Each student may be given an alias (e.g. Snoopy) which may be assigned by the instructor or self-selected by the student. This alias is appended to each comment. In this way an instructor may determine levels of participation and even who submitted each comment if they assigned the alias.

**Application: Information Categorization and Synthesis**

GOAL: Help students organize lists of topics for better learning.

MODULE USED: Categorizer

Some course topics are presented as a long list of guidelines or rules (e.g., usability guidelines for system design). These lists are extremely challenging for

students to learn, especially if there are several complementary but slightly different versions of these lists, possibly using differing terminology from different sources (e.g., design guidelines for forms and reports, user-interface design guidelines, etc.). Many students simply attempt to memorize these lists, but this can be very difficult and does not increase understanding of the guidelines. Groupware can aid with the learning process associated with these lists in two ways. First, students can use groupware to create a shared master list of all guidelines and definitions compiled from all sources. More importantly, students can then use an organizing tool such as Categorizer to analyze the master list and combine guidelines into a smaller, more manageable list of overarching guidelines supported by detailed guidelines for specific areas. This categorization process increases students understanding of the guidelines as they attempt to identify similarities and differences while simultaneously providing a more manageable list of topics to remember.

**Application: Process Definition and Improvement**

GOAL: Support the group oriented methodology of business process re-engineering.

MODULES USED: Group Outliner; Brainstorming, Vote

Process improvement is a critical topic in the business world and so the topic is finding its way into many business classes and curricula. However, in many of these classes, although students learn techniques for defining and improving processes, they may not have the opportunity to improve an actual process. Groupware can be configured to provide this opportunity to students. First, students use an organizing tool such as Group Outliner to rapidly define the steps required to accomplish a specific process with which they are familiar (e.g., their university's course registration process). Then, they can brainstorm to identify problems and potential improvements to the process or specific steps in the process. Finally, they can use the Vote module to rank-order improvement ideas based on different criteria (e.g., potential benefits, organizational feasibility). The last step can be extremely valuable to students because it can dramatically show that the improvements with the greatest potential benefits may not be feasible to implement from an organizational perspective.

**Application: Scenario Planning**

GOAL: Familiarize students with the strategic forecasting process of scenario planning.

MODULE USED: Electronic Brainstorming

Scenario planning is technique originated by C. Ralph MacNulty and made famous by the Royal Dutch Shell company in the 1970s (Hiam 1990). To be effective in scenario planning, a group must be able to relax the constraints of their problem domain. Instructors, wish to place the group members in the most divergent and creative state of mind possible. In their efforts to build scenarios, the group members must be encouraged to think out of the box. One analogous problem-solving technique is story telling.

Since most students will not have the experience necessary to learn both the concept and the activity of scenario planning at the same time, we separate the learning process into three key goals: acquaint the groups with the technology - the software being used; practice the methodology they will use - the process; and provide a base level of socialization - a team building exercise. In this exercise, the group is instructed to create a set of fairy tales of their own design by responding to the prompting clause of, "Once upon a time ... ." The activity continues with the electronic slips of paper randomly visiting the group members with their fairy tales growing comment by comment.

The energy created during this exercise is extremely rewarding to watch. Group members get excited about their contributions and about reading the next vignette coming to their screen. Audible laughter and "joking" verbal comments are common. Often it is difficult to get group members to disengage from the activity without a lot of prompting. As an end to the exercise, a public review of the fairy tales generates quite a lot of enthusiasm and positive, inter-group member feedback.

From this point, it is relatively easy to re-focus the energy developed by the group on the new topic. For a real-world group, this activity becomes a scenario development tool with the new brainstorming prompt, "Over the next five years, our business will change because ...". For a student group, a new brainstorming prompt such as "From this point forward, ABC company needs to work on ..." creates a case analysis tool. Now as the electronic slips of paper are passed around, students are creating possible strategic case scenarios for consideration.

**Application: Student Team Project Definition**

GOAL: Obtain student input on topics and questions for class presentations.

MODULES USED: Topic Commenter; Electronic Brainstorming; Vote

A common response to the request for additional communication skills, described in the opening section, is to include group presentations on salient topics related to the course content as part of the course. The compelling question is “salient to whom?” Old-fashioned teaching says let the instructor decide; new learning centered education says help the students decide. To this end, we have used groupware to help students develop a set of possible presentation topics salient to the members of their class for a project. The software then facilitates the creation of a list of pertinent questions or issues that students want to have answered or addressed by the team presenting that topic. In the example from a capstone IS class Exhibit 1 below, one team decided on the topic “e-commerce for children” and the class responded by entering related questions and suggestions for the presentation. The students have helped develop one of the main criteria for grading the presentation; How well does the presenting team cover the questions?

#### **5. e-commerce for children**

Hot sites that encourage children, but also encourages safety or helps parents monitor safety

What exactly is e-commerce for children, examples please...

can we truly make content safe for children to see....NOTE...my buddy has a website that focuses on games (computer games) and that little dog web-nanny keeps blocking his site....he's been branded as having a site that's bad for kids when all he is doing is helping kids win games....what's up with that?

What age groups are you talking about?

What is being done to stop access of porn sites by children that accidentally type in the wrong URL?

Is kitty porn bad for cats?

How many credit cards do kids have? I still can't get one!!!!

Legal Contracts and minors?  
Responsibility/Liability of online transactions?

Are there educational sites for kids? Such as teaching them financial responsibility?

Who wants children to be able to buy on the internet? Do businesses really want to sell to minors, or is the idea that they may be selling to

minors without realizing it?

Will the professor take everyone out for beer if this is a good presentation??

#### **Exhibit 1: Transcript from Team Project Definition**

This interchange creates a better learning environment on several levels. First, the students have participated in identifying and choosing the topics of interest for the presentations in their class. This helps the teams commit to their topic as they are now aware of the stated interest by fellow students. Second, specific questions and issues for teams to address in the presentations are pinpointed. This helps the teams research and target their final presentations. Finally, the coverage (or lack) of the defined topic areas by the presenting team provides a measure for the instructor to evaluate the presentation based upon the class criteria.

#### **Application: Student Team Project Reviews**

GOAL: Demonstrate real-world practice “structured walk-through.”

MODULE USED: Electronic Brainstorming; Topic Commenter

Because of the increasing emphasis on teamwork in business, many business classes include a team project as a major component of the class. Team projects typically require both a written report, reviewed by the instructor, and a team project presentation to the entire class. A continual challenge for instructors is how to engage the class during those team presentations. Some instructors have the class evaluate all presentations. Others may assign a second team the responsibility for leading the class discussion of a team’s presentation. Groupware can be used to implement and enhance these approaches, by having all students simultaneously list and input questions and recommendations during the presentation. Teams can then respond to key questions when they complete their presentation and consider the remaining feedback at a later time. This technique has proven to be a very effective information-sharing technique for teams conducting real-world Systems Analysis and Design projects. Students can unobtrusively recommend consideration of alternative hardware/software solutions or highlight potential problem areas that a team might not have known about, thereby improving the quality of the team’s information systems solution for their clients.

#### **Application: Groupware Curriculum Course**

GOAL: Exhibit the fundamental concepts and manual

methodologies for teamwork and ways in which they may be automated with groupware.

MODULES USED: All

The use of groupware provides the opportunity to introduce the conceptual foundations of groupware and decision support systems into a Business School curriculum. The conceptual foundations of individual and group problem solving can be demonstrated instead of simply discussed. The course created for this purpose is taught in two phases. The first phase introduces the students to the concepts and demonstrates those concepts with the software. For example, brainstorming techniques such as Osborn's brainwriting (1953) or Van de Ven and Delbecq's Nominal Group Technique (1974) can be executed manually by the class. Once understood, then an automated version of the same process can be demonstrated with groupware.

The second phase of the class requires the students (usually in two person teams) to identify, organize and facilitate at least two real meetings for a real group. The groups are usually obtained from on-campus but have also included off-campus groups such as county and local charitable organizations. This active learning environment provides students practical experience instead of simply reading or hearing another lecture about group process losses and gains. Now, they have to work with a real work group and their leader to plan a meeting; build an agenda; encode the agenda into groupware; facilitate a group meeting with all the inherent risks of groups; and prepare a summary report for management (the instructor). This process drives home the concepts surrounding managing groups and teams more forcefully than any lecture.

#### **4. LIMITATIONS**

As mentioned, the use of groupware in this manner does present some challenges for the classroom environment. Briggs, Nunamaker and Sprague (1998) provide a good starting point in their "unanswered questions." For example, without removing the anonymity inherent in groupware product usage, it is more difficult to attribute and to assess the input of individual students in discussions and writing activities. However, this issue can be minimized if anonymous, electronic activities are not used for all class discussions or writing activities and are not the only basis for a student's final grade.

Another problem arises occasionally when students take advantage of the fact that all input is anonymous and use the medium to "flame": to make lewd, sexist or otherwise unprofessional comments. Exhibit 1 has two

examples of these types of non-task remarks. In a more formal research environment, Reinig et al. (1998) describe an electronic classroom and attempt to develop a model around the impact of "flaming." In practice, these comments are always openly discouraged by the instructor and are eliminated from the final document that is distributed to classmates. This problem is more typical in brainstorming activities with younger, student participants and Exhibit 1 notwithstanding, has rarely been an issue with upper-division undergraduates or graduate student groups.

Finally, there is a set of limitations around the socialization issues of group members. In a lot of work groups, there is a need for groups to work together and socially "bond," not just to remain solely task oriented. The inability for groupware to provide sufficient social interaction remains a source of concern (Walther 1992). For example, tasks requiring a consensus choice have provided ambiguous results in the groupware environment (Benbasat and Lim 1993; Briggs et al. 1998; Fjermestad and Hiltz 1999). Here again, technology and the corresponding anonymity may reduce the perceived ownership of the actions or plans, which in turn may lower commitment to the decisions.

#### **5. CONCLUSION**

One way to respond to business school curriculum critics is by creating more team-based and student-oriented learning environments. The concepts underlying groupware seems to address these needs well. The paper provides eleven practical teaching tips whereby groupware may become a productive tool in the classroom. Based upon experiences using these tips within a business school environment, we proffer that: (1) Groupware provides the characteristics needed in order to create a student learning environment wherein students are more involved in actively constructing knowledge and creating/evaluating their own learning experiences; (2) Using groupware practically (hands-on) demonstrates the key issues involved in group work; (3) The characteristics of simultaneous and anonymous input may create a classroom environment wherein more high quality work may get done; (4) With an emphasis on group work, the critical group, communication and problem-solving skills valued in the current business environment may be enhanced. Ultimately, students who have used groupware in classes should be significantly better prepared to meet these same demands and expectations from their future employers than those who have been exposed only to the traditional classroom environment.

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