Active Learning in Business Education With, Through, and About Technology

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ABSTRACT: *In this paper we present a pedagogical approach used for a technology-based undergraduate business course during which students participated directly in the development of a Group Support System (GSS) facility. A GSS is a computer-based information system used to support intellectual, collaborative work and consists of personal computers connected via a local area network with software that enables group members to interactively generate, evaluate, and organize ideas, rank or vote on solutions, and perform other group tasks. This course was designed to teach students to work together within and across teams and to help them to develop and use critical thinking and applied problem-solving skills. In this paper the pedagogical approach and course structure used are described, the outcomes of the course are discussed, and recommendations are offered.*

INTRODUCTION

Although current theories of and approaches to learning, such as cooperative education, experiential education, and individualized learning, support the creation of student-centered classrooms, content in the typical university course is delivered by means of lecture and the focus remains on the passive reception of knowledge by students. [1] [2] This passive "learn by listening" process is incompatible with curricular goals which emphasize critical thinking and the active development of problem-solving skills. Business education in particular has been criticized for an overemphasis on the delivery of theory and the neglect of "real world" experience and active, applied learning. Business schools, however, have begun to develop creative solutions which address this problem. [3]

Many broad-based (college- or department-wide) solutions to this education problem show promise; however, because of individual, departmental, institutional, and/or system-wide constraints, such solutions may not be feasible. One possible strategy for addressing the needs of students, administrators, and potential employers is to focus on changing the individual course. This paper describes a technology-based undergraduate business course during which students participated directly in the development of a Group Support System (GSS) facility. This course was designed to teach students applied learning, critical thinking, and problem-solving skills using technology as both course content and method. We believe that as a result learning was enhanced and the institution benefited from the course.

The purpose of this paper is to describe the pedagogical approach taken in this course and the resulting outcomes. We first present the pedagogy and objectives of the GSS course, followed by a summary of the course syllabus and student projects. We then end with a concluding discussion in which we present some recommendations for and implications of this approach.

COURSE OBJECTIVES

Education research suggests that adult learners are capable of taking responsibility for their own learning, and they learn best through two-way communication and reflection on their own and others' experiences. [4] Thus, learners should be treated with respect and should be partners with the instructor in the learning process, actively influencing the learning approaches used in the course. The instructor should also encourage self-directed learning, avoid over-use of lecturing, emphasize discussion, use interactive methods, promote inquiry into problems, affirm the experience of participants, and provide for the students opportunities for success and a rationale for becoming involved. [5]

In order to provide learners with the environment described above, a GSS course (titled "Special Topic: Group Support Systems") was created through which the students could participate directly in the development of the campus GSS facility, the Center for Decision Making. A GSS is a computer-based information system used to support intellectual, collaborative work and consists of personal computers connected via a local area network with software that enables group members to interactively generate, evaluate, and organize ideas, rank or vote on solutions, compose and edit text together, or interactively create and modify images for drafting and design tasks. GSS are often housed in a facility which includes audio/visual presentation support and printing capabilities and is dedicated for computer-supported group work. [6]

The course was offered at the 400-level, and the prerequisites were the core, 300-level, introductory information systems course and the consent of the instructor. Nearly all of the students enrolled in the course were seniors in their final semester before graduation. The instructor was a professor of Information Systems who conducted GSS research, taught both Information Systems and Management courses, and had training, education, and experience in areas of Information Systems and

lanagement. Implementing the new GSS ourse could be achieved relatively easily be- ause the changes were aimed at one course ather than the entire curriculum, depart- ent, college, or university.

The learning objectives for this course ere to have students learn to work together ithin and across teams, and to develop and se critical thinking and applied problem- olving skills. The intent was to help the stu- ents to gain and practice higher-order think- g skills such as analysis, synthesis, and evalu- tion. [7] The content objectives of this ourse were to have students: 1) understand hat GSS are, 2) experience how GSS can elp individuals, work groups, and organiza- ions achieve greater productivity, 3) experi- nce the effects that these systems have on roup and organizational processes, and 4) ex- erience the ways that people appropriate, se and can misuse these systems. To reach hese goals the course took place in the con- ext of a working GSS facility where students articipated directly in the development, aintenance, use, marketing, and manage- ent of the GSS facility. On the few days that he course did not meet in the GSS facility, he course met in a nearby computer-based lassroom.

COURSE DESIGN

Following the suggestions of education re- earchers ([8] [9] [10]), students in this GSS ourse were given the opportunity to take ontrol over important aspects of their learn- ng. To encourage students to pursue their in- dividual interests, they were asked to choose ne of three books on teams. In addition, the tudents were asked to choose three articles mong a pre- designated set of about a dozen esearch articles on GSS that were on reserve or them in the library. Students were also sked to choose three outside readings that were of interest to them and that would be elevant to the project they would complete. One of these three readings was to come from the research literature; the other readings were to have been selected from the popular press.

In order to apply higher-order thinking skills, and to foster sharing of ideas in class, the students kept journals in which they summarized what they had learned from each of the readings. To better manage their projects, students also kept in their journal a log of their daily activities during the class sessions and their daily activities for their project. The day-to-day activities were divided among the following activities: lecture, discussion, exercises, GSS training, GSS sessions with the entire class and with sub-groups, project development, project review, and discussion of journal entries. In this course a great deal of the responsibility to define work and complete it on time was placed in the students' hands. So that students would share their experiences, learn from the experiences of others, and participate in cooperative problem solving, students were expected to participate in all class discussions, presentations and activities.

The real focus of the class was a "hands-on" project. Each student worked with the instructor to define a project and a paper. To give the students task control, students were free to choose how and with whom to complete their projects. Of the twenty-eight students in the course, five chose to work alone, and the remaining students formed teams of either two, three or four members each. Similar to the "alternatives within limits" approach [11], students were given project categories to choose from to insure that the scale and scope of the projects were appropriate. They were encouraged to choose from one of the following categories: Technical Feasibility Study, Systems Development, Meeting Facilitation, Marketing Analysis, Directed Research. So that the students' choices would not be unnecessarily constrained, the project categories were made as exhaustive and as flexible as possible.

The approach used for the teamwork in this course was a cooperative team approach, rather than a competitive team or individualistic approach. The cooperative team approach utilizes positive interdependence among team members and teams, which promotes interaction, trust, mutual support, and can be highly motivational and emotionally involving. [12] [13] The teams concurrently used a group investigative approach [14], whereby the team members were given the resources and freedom to work together as they saw fit to gain information and solve problems.

STUDENTS PROJECTS

To further emphasize the "real world" nature of the course, and to promote cooperation among and between teams, the projects were managed just as they would be in industry. All projects were treated as integrated "sub-projects" that were part of one broader project - building the facility. Each team gave periodic project progress reports at round-table meetings held during class time. At these meetings, the status of each project was discussed, and students helped each other to solve problems associated with their projects. One student, whose project is described below, developed a spreadsheet for tracking and managing all student projects for the course. This system provided periodic, printed updates of each project's status.

All projects involved GSS technology, with some students choosing to complete projects that were more technical than others. The flexibility in choice, and the subsequent diversity in technology-related projects, were appropriate given that the students were not all information systems majors and came from all areas of business.

Brief descriptions of each project are provided in Table 1. Project descriptions demonstrate the real-world, applied learning and the kinds of opportunities that were provided for students to develop their thinking skills.

The projects required the students to develop and practice critical thinking and applied problem-solving. Students first had to determine what type of project: a) interested them, b) fit with the course content, and c) would be useful to the facility and the university. Students then had to complete their own projects, solving their own problems along the way. This problem-solving occurred within teams, between teams, and with the instructor, and involved applying lessons from their readings. Students were encouraged to seek out other people to help them solve prob-

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lems. For example, students sought help from staff members from the university's computer center, administrators, faculty at other universities, software and hardware vendors, and others.

Following the cooperative team approach helped students to learn teamwork and team building skills, and taught them to work cooperatively with other individuals and teams toward a common goal. Because they used a group investigative approach, all projects provided some tangible benefit, solved a real problem, and/or fulfilled a real need for the facility. Every project was used in the actual development of the facility.

THE ROLE OF TECHNOLOGY

In addition to being the focus of the class, the GSS technology was also used to deliver content, to enhance learning, to manage projects, and to change teacher and learner roles. In the beginning of the course the students used several GSS packages and related technologies to gain first-hand knowledge and skills about the technology and to become educated consumers of the technology. In this case, we believe that there was no better substitute for learning about the technology than actually using it.

For further development of higher-order thinking skills, the students then participated in GSS sessions about GSS technology. For example, after synthesizing information about GSS research and development, the students discussed the potential advantages and disadvantages of GSS, they predicted the potential uses and misuses of GSS, and they imagined what might happen if GSS use became pervasive in a country like Japan. For these sessions the class would typically generate and evaluate each others' ideas using an interactive brainstorming tool. They would then organize their ideas using a chauffeured, idea organization tool, and they would use a ranking tool to independently rank the alternatives and use the software to develop the group members' average ranking for each item on the list. In this way, they used GSS as a process for learning GSS content. Because the GSS enables participants to interact easily and anonymously in comprehensive, yet flexible discussions [6], the GSS provided for the instructor and students in this course an effective, efficient vehicle for learning content. Through the GSS sessions and the readings all students learned a common core of knowledge about GSS, even though they worked on separate projects.

Students also used GSS to brainstorm together throughout all phases of their projects, which helped them to solve problems and

Table 1: Brief descriptions of each project in the GSS course.

1. Technical Feasibility Study

One team conducted an analysis of relevant Local Area Network Operating Systems. Their report focused on the performance and security of Windows for Workgroups, the network we used in the Center, compared to competing LANs. They made recommendations as to how we could optimize and secure our network and avoid potential problems.

One team conducted an analysis of Virtual Reality hardware and software. In their report the team proposed ways that VR technology could be used in the Center in conjunction with traditional GSS sessions.

2. Systems Development:

One student worked closely with the instructor and the other teams to develop a database application in FoxPro for Windows that is now used to monitor all equipment, potential customers, clients, and meetings.

One student developed an application in Microsoft Excel for tracking and managing all student projects for the course. This student used the system as project coordinator, providing continual updates of each team's status and posting status printouts in the Center so all could see the progress of each team.

One student worked closely with the instructor and the students training to be facilitators to help beta-test the OptionLink GSS software, by Option Technologies, Inc., and write full documentation and a user's manual for the software.

3. Meeting Facilitation:

Two teams trained as meeting facilitators and then each facilitated their own live meeting in our computer-based classroom. One team facilitated a meeting for the instructor and students of another class and one team facilitated a live meeting with employees from a local office of Mobil Oil.

4. Marketing Analysis.

One student worked closely with the instructor and the marketing teams to conduct research on the donation process in the California State System, write sample cover letters and thank you letters for donation solicitation, and began building relationships with contacts at various local equipment vendors. The student then finished by writing a report recommending a strategy for the donation solicitation process.

One team wrote a mission statement for the Center and conducted a marketing analysis. Their analysis included a competitor analysis of local GSS facilities and meeting rooms at local resorts and hotels. They also conducted a SWOT analysis (strengths, weaknesses, opportunities, and threats) for the Center.

5. Directed Research.

One team participated directly in the design of the Center. They analyzed chair types and recommended a particular brand that was selected and used as the chair of choice in the Request For Proposal sent out for bids on the chair purchase. They drew a scale blueprint of the room and through space utilization analysis helped us to decide on an optimal design for the table. They then drew a sample table design which was used in the Request for Proposal for the table bid. They also conducted research on lighting and the ergonomics of computer use in the Center.

One student interacted with all other teams and wrote an analysis of the effects of GSS use on organizational structure and functioning.

complete their projects cooperatively. In this way the GSS was used as a tool for better managing and completing projects. In addition, as described above, a student-developed data base was used to manage the facility, and a student-developed spreadsheet was used to manage projects.

The various uses of the technology helped to deliver course content, give students a feel for the technology, and manage the facility and projects. The technology also helped to change the role of teacher and student. Because a GSS was used to deliver content and to help students learn about GSS processes and manage their projects, the instructor was able to act as facilitator, assisting in designing and running GSS sessions, rather than standing before the class and disseminating "knowledge." In addition, the students were encouraged to learn actively and to take control over their learning. The way that the GSS was used provided the students with a less threatening, more efficient method with which to "voice" [15], to express and implement concerns, suggestions, and ideas through active and constructive contributions.

OUTCOMES

A variety of outcomes from this GSS course suggest that the approach taken was successful. First, both the course content and learning objectives were met. The students "experienced" the GSS content area by using the technology to examine the technology. As a result, while meeting content objectives the students were also learning actively and through cooperative problem-solving. The technology was also critical in enabling the students to manage and complete their projects, which also helped students to be active in applying their learning and solving problems cooperatively. In addition, because of the way that projects were used, learning was self-directed and interactive and students actively influenced the learning approach. Indeed, we believe that because the GSS technology was used as both course content and method, the roles of teacher and learner were changed. The benefits provided by the GSS enabled the teacher to become facilitator and the students to become active learners with effective voice in the process.

In addition to meeting objectives, the course was evaluated positively by students and the instructor. Standard quantitative, written evaluations of the course and instructor were used in the GSS course. Although such evaluations were not used as the sole assessment of the course, they provide useful information about the effectiveness of the instructor and the success of the course. On quantitative items the course scored well above the average for all courses in the College of Business Administration. For example, for a recent offering of the course the average score for the item which asked students to rate "the overall quality of the course" (scored on a 5- point Likert scale) was 4.90 (n=22), while the mean for the entire College for that semester on this same item was 4.18 (the two means are significantly different, $p = .000$).

Students' written comments on the evaluations were overwhelmingly positive and thus supported the quantitative data. In particular, students wrote that this course provided them with an applied learning environment which they valued highly. Among the elements of the course of which the students wrote favorably were experiential, hands-on learning, skill utilization and development, autonomy, involvement, real learning, and learning in a setting unlike the "normal classroom." One student wrote that he/she "would have preferred a bit more structure." The instructor's evaluation was equally positive. Because students were motivated, worked hard, learned, and enjoyed the course, the course was very satisfying for the instructor. The instructor felt like a facilitator among eager, competent colleagues.

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Although not as important as meeting pedagogical objectives, there were other useful outcomes achieved by this approach to the GSS course. First, this approach provided a useful, needed service to the university. A great deal was accomplished for the Center and the quality of the work was better than it would have been if the work had been attempted by a lone technology champion. In addition, the commitment for the Center has spread throughout the organization, beyond the initial few champions of the technology concept.

An ancillary benefit to this approach was that the GSS course enabled students to be directly involved in faculty research. In this course they helped to design and build a GSS research facility, shape its mission, assist in the launch and operation of the Center, facilitate and formally evaluate GSS meetings, formally evaluate and document GSS software, content code GSS meeting transcripts, and experience and theorize about GSS uses and effects. More important, they gained a better understanding and appreciation for what research is and why it is important. While good teaching and good research are desired, often required, teaching and research are seen by many professors and administrators as mutually exclusive activities that cannot be integrated well, if at all. In fact, many believe that an hour spent on teaching is an hour taken away from research, and vice versa. This course demonstrated that teaching and research can be integrated successfully.

CHANGES TO THE COURSE

In the summer following the first offering of the course it was offered again. Seventeen students enrolled and continued the development of the GSS facility with useful projects. One team facilitated its own live meeting. One team developed an observational checklist and a list of interview questions for assessing facilitator effectiveness. One team developed an instrument to measure the participants' satisfaction and perceptions of meeting effectiveness. One team developed a plan for how to market the Center using various media and methods (including a sample brochure). One student created a list of interview questions for prospective users and then interviewed a dozen potential users, each a top executive from a local organization. One team created a professional 10 minute marketing video for the Center, which was completely scripted and included the instructor and students in simulated face-to-face and computer-aided meetings. One student wrote an analysis of the potential uses of the Center in his organization, the San Diego city government.

After the first GSS course, it was apparent that some enhancements could be made. One way that the GSS course was improved in the second offering was that more structure was added to the course; this is in response to one student's written request for more structure via the course evaluations and the instructoris sense that other students in the course needed slightly more structure. In order to provide more structure in the second offering of the course, the instructor gave more details about

the project and other assignments, imposed firmer deadlines for the project and assignments, and used more lecture while still relying heavily on discussion and exercises. Despite these changes, the course retained the same fundamental sense of freedom and autonomy; the autonomy merely became more directed.

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Another issue that had to be addressed was the students' frustration with the complexities and slow time frame of the state university. In building the facility it took four months to have a door moved, three months to have a light switch installed, and even longer to have furniture made ready and delivered. The students were highly motivated and anxious, and, although they were able to complete their own projects and to see the completion of the other students' projects, they wanted to see the new door and light switch installed within their sixteen week semester (four weeks in the summer session). Unfortunately, for the most part these delays stem from an institutional and system-wide bureaucracy that cannot easily be changed. With the condensed format of the shorter summer course, the instructor had to help the students to cope with the university's slow-moving bureaucracy and the resultant project difficulties. Fortunately, because the students were mature and nearly all had work experience, they understood and learned from the difficulties and delays.

One final change to the GSS course is that the content of the course will change slightly now that the facility is nearly completed. Future GSS courses will be aimed at managing, maintaining and improving the facility, equipment and software. In addition, rather than being offered again as a "special topic" course, the course was added as a permanently available elective course in the university catalog, with the title *Group Support Systems*.

The facility was completed shortly after the second offering of the GSS course, to a great extent due to the work of the students in the course. The facility now has 24 HP Vectra personal computers each fully embedded within a custom-made conference table and connected to each other, to a laser printer in the facility, and to the Internet, via Novell Netware. Each workstation has a full complement of Microsoft Windows software applications and the GSS software used includes Enterprise Solution's MeetingWorks and Option Technologies' OptionFinder and OptionLink. There is also a color projection system and a large, electric projection screen mounted overhead. Much of this equipment and furniture was assembled in the facility by the students.

IMPLICATIONS AND RECOMMENDATIONS

There are several important issues that this teaching/learning approach raises. A number of these issues are technology-related. First, the approach taken with this course promoted applied learning about, with, and through technology. This was not simply a case of using a computer to do something in the classroom faster. The technology can and, in this case, did, play multiple, diverse roles and was used simultaneously as both content and process. Second, the approach taken in this course was not purely technology-based. The approach involved extensive use of GSS technology along with sound, reasoned pedagogical strategies regarding critical thinking, applied learning, and cooperative learning. The approach worked because it was technology-supported, not because it was technological.

Another technology-related issue is whether or not the technology was necessary. Aside from the fact that the course was about GSS, the approach taken in this course might have been accomplished without use of the GSS technology. However, to do so would have been much more difficult and time consuming, making it, practically speaking, impossible. For example, instead of using the GSS for "real time," anonymous, interactive problem-solving for projects, we could have used a similar pencil and paper process. Such a manual process, however, would have been so tedious and time-consuming that the students and instructor would have soon rejected it. This is a classic case where, in the absence of the technology, we could not have accomplished what we did as quickly and easily as we did, and thus we would not have been likely to even attempt it.

The approach taken in this course also addresses the relationship between technology and problem-solving. As argued by Hofmeister [16], when using technology for problem-solving, teaching of problem-solving strategies should be integrated with the teaching of other domain content, and the problem-solving strategies should be generalizable to other problems, settings, and domains. We believe that course objectives were met because students used the GSS technology to learn about problem-solving and about the GSS content area, including general issues in GSS use and specific problems regarding their GSS-related projects. Further, the problem-solving strategies used were easily generalizable. For example, while we were using the GSS to generate, evaluate, select and implement solutions for best marketing the GSS facility, the students were learning problem-solving processes (e.g., Simon's problem solving model [17]; Schwenk et al's consensus decision making approaches [18], and so on) that could be used for other problems, settings, or domains.

Whether or not a course such as this one is appropriate for other universities depends on the extent to which they are ready for innovation. This business course is innovative for two reasons. First, it is part of a small but growing movement in business education toward an emphasis on active learning. Second, there are few university courses devoted solely to GSS, particularly at the undergraduate level. To determine whether this approach for the GSS course is appropriate for another institution, educators should consider the students, faculty, and culture of the institution. A fundamental component of good pedagogy is knowing what students are capable of. We knew that the undergraduate business students enrolled in this course were, on average, older than the average undergraduate student nationally by nearly eight years, nearly all of these students worked, and they tended to have an entrepreneurial spirit commensurate with attending the first start-up public university in California in nearly 25 years. We believe that the extent to which students possess these types of qualities will likely determine how willing and able they will be to participate successfully in a course of this nature.

Faculty acceptance of a course like this is as important as student acceptance. To teach a course in this way an instructor must be well organized, be willing to act more like a facilitator or project manager than a "teacher," and be flexible. More important, the instructor must be willing to forego the traditional style of teaching, where the instructor is the sole

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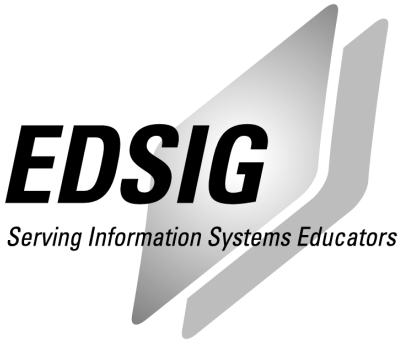

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