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ABSTRACT

In building an online course or transforming a traditional course for online delivery, the most critical element is not the selection of appropriate media, but the selection of the most effective teaching strategies. Competitive online courses are those that are designed: to involve students in the learning process; to engage them in conducting learning activities; and to enable them to readily apply what they learned in the real world. This paper presents a case scenario where an undergraduate course was designed based on the instructional theory model of collaborative problem solving (CPS). It demonstrates the rational for choosing the theory and the design of the course following the guidelines suggested by the model. Student feedback and suggestions on improvement are also presented. (Author)

Collaborative Problem Solving in the Online Environment: A Case Study of a Web-based Undergraduate Business Course

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Abstract In building an online course or transforming a traditional course for online delivery, the most critical element is not the selection of appropriate media but the selection of the most effective teaching strategies. Competitive online courses are those that are designed; 1) to involve students in the learning process, 2) to engage them in conducting learning activities, and 3) to enable them to readily apply what they learned in the real world. This paper presents a case scenario where an undergraduate course was designed based on the instructional theory model of collaborative problem solving (CPS). It demonstrates the rational for choosing the theory and the design of the course following the guidelines suggested by the model. Student feedback and suggestions on improvement are also presented in the paper.

Collaborative Problem Solving

Collaborative problem solving (CPS) is a newly developed instructional theory that combines two instructional approaches: cooperative learning and problem-based learning (Nelson, 1999). It emphasizes cooperation—the key of cooperative learning—in the context of "a carefully constructed problem scenario", which is the essence of problem-based learning (Savery & Duffy, 1995). As a theory model, CPS provides guidelines that address the whole process of collaborative learning including: a) building a readiness in students to learn collaboratively; b) developing group skills; c) forming groups; d) engaging in collaborative problem solving; e) finalizing the process through appropriate analysis, synthesis, assessment, and closure activities (Nelson, 1999).

The goal of CPS theory is to develop knowledge of a content area that consists of complex domains. In the meantime, it emphasizes the development of problem-solving, critical thinking, and collaboration skills. CPS holds the pedagogical values of maximizing the natural collaboration processes of learners; creating a situated, learner-centered learning environment; honoring ownership of the learning experience for students; encouraging content analysis and exploration from multiple perspectives; acknowledging the importance of social context for learning; and cultivating supportive relationships among learners (Nelson, 1999). With group problem solving being a common practice in this age of information, collaborative problem solving prepares learners with the most necessary skills in the workplace – the ability to collaborate and a desire for lifelong learning.

Using Collaborative Problem Solving in INS 344

INS 344, Commercial Liability Risk Management and Insurance was offered by the School of Business at Indiana State University as a required courses for undergraduate students majoring in insurance and risk management and as an elective course for other business majors. It is also part of the DegreeLink program, which offers students with associate degree an opportunity to get a baccalaureate degree by completing two additional years of coursework in the areas of insurance and business administration. Since most of the DegreeLink students are working adults who are not able to attend classes on campus, DegreeLink courses are delivered over the distance using the Web as the major modality. INS

344 that previously was offered as a face-to-face class, became available online in the fall semester of 2001. Sixteen students enrolled in this solely web-based course, seven students were majoring in Insurance and Risk Management and nine identified other areas of business including Business Administration, Finance, and Commercial Law and Accounting.

The design and development of INS 344 from face-to-face to the online format took place a year before the delivery. The transformation brought dramatic changes to the course not only in terms of its delivery media but also the instructional approach. Instead of using the traditional textbook chapter-by-chapter coverage, the instructional designer and the instructor decided to change the instructional design to a project-driven course with strong emphasis on interaction and collaboration among the learners themselves. Among the various available instructional theories, collaborative problem solving (CPS) was chosen because of the good match between the course and the CPS conditions including type of content, learning environment, and characteristics of both learners and instructor.

Course Content

INS 344, Commercial Liability Risk Management and Insurance, focused on an examination of the major commercial liability loss exposures including premises, products, completed operations, contractual, workers' compensation, and other miscellaneous liability coverage. During this class, students were asked to identify and analyze different corporate liability risks and then to select optimal combinations of risk treatment and insurance for financial protection against liability losses. The assignments in this course were mostly heuristic in that they required a complex system of knowledge and skills that could be combined in a variety ways to complete the task successfully. The content of the course therefore suited the conditions for using CPS, which is found to be most appropriate with heuristic tasks as opposed to procedural tasks (Nelson & Reigeluth, 1997).

In addition to the complex nature of the project scenarios and the variety of knowledge and skills needed for completing the assignments and obtaining project solutions, the individual projects also varied from one group to another. Thus, there would not be a single question or one best way of doing something – a situation in which CPS is found to be most appropriate methodology to use (Nelson, 1999).

Learning Environment

A learning environment conducive to collaboration, experimentation, and inquiry was found to be the most effective environment for CPS (Nelson, 1999). Therefore, building this type of learning environment was the intent of the instructor and the designer of INS 344, including a component that would provide sufficient time for individual groups to become established. To support interaction among project team members, group space was created to enable online communication via email, discussion board, file exchange area, and virtual chat room.

Learner Characteristics

Nelson (1999) pointed out that having self-directed learners who are comfortable with, and willing to take responsibility for their own learning is an essential factor for the successful implementation of CPS. The characteristics of a CPS learner coincide with that of a successful distance learner in terms of independence and self-discipline (Nipper, 1989 & Guan, 2000). Other findings indicate that students who choose to take distance courses demonstrated lesser need for control and affection. They had more need to initiate actions than to wait passively for actions (Guan, 2000).

Instructor Characteristics

Having taught three different online courses, the instructor was comfortable in his role as a facilitator who would spend most of his time observing students' interactions and would intervene only when it was absolutely necessary. He was therefore well suited to the CPS approach, which requires that instructors be flexible and tolerant of a certain degree of ambiguity in what exactly is to be learned and how the learning will take place (Nelson 1999).

Designing and Developing INS 344 with CPS

As a comprehensive instructional theory, CPS provides two general categories of guidelines to assist the implementation process: (a) *comprehensive guidelines*, which support the entire process, and (b) *process activities*, which provide step-by-step guidance for designing the appropriate learning activities.

Based on the *comprehensive guidelines*, the roles and the responsibilities of the instructor and the learners were clarified as the following:

Instructor:

- Provide resources as needed by the learners
- Identify roles in each project team
- Establish project timeline
- Formulate questions to focus learner on the critical elements of the content
- Facilitate group building
- Collect feedback from students and modify learning activities
- Offer just-in-time instruction when requested by learners

Learners:
- Prepare for team project by completing a mini project
- Select roles in the project team
- Collaborate with team members in identifying a problem pertinent to the subject area
- Collect background information of the company where the problem was identified
- Propose and conduct cost-benefit analyses for alternative solutions
- Complete online learning exercises over commercial liability content areas
- Present recommended solutions to the problem
- Share the final project report with the whole class

Instructor & Learners:
- Collaborate to determine learning issues
- Exchange/share learning resources
- Conduct formative and summary evaluations
- Provide group and individual evaluations
- Offer suggestions for course revision

In contrast to the comprehensive guidelines, which help clarify each party's responsibilities during the learning process, *process activities* provide guidelines for building the learning events. As a project-driven course, the content of Insurance 344 was structured around the need to recommend solution(s) for a major business problem facing a large corporation. As shown in Table 1, the learning process consists of seven learning modules, each carrying at least one process activity suggested by CPS.

Table 1. INS 344 Learning Modules & Collaborative Problem Solving Process Activities

Learning Modules	Process Activities
Module 1: Introduction	1: Building Readiness (as an individual)
Module 2: Team Building, Role Selection	2: Form and Norm Groups 4: Define and Assign Roles
Module 3: Warming Up Exercise for Team Project: A Mini-Case	1: Building Readiness (as a group)
Module 4: Company Background	3. Determine a Preliminary Problem Definition
Module 5: Problem Identification	3. Determine a Preliminary Problem Definition 5: Engage in Iterative Collaborative Problem-Solving Process
Module 6: Solution Alternatives – Cost/Benefit Analyses	5: Engage in Iterative Collaborative Problem-Solving Process 6. Finalize Solution Alternatives 7. Conduct Financial Analysis
Module 7: Recommended Solutions	8. Synthesize and Reflect
Course Survey	9. Assess Products and Processes 10. Provide Closure

Although the learning modules were in accord with the CPS process activities, the sequence of procedures was slightly altered. Because the course was offered totally online, adjustment was made in a few areas: a) introduction to online learning, b) pre-defined roles of project members, and c) instructor-built project timeline.

Introduction to Online Learning

An introductory module was created for the very beginning of the course to prepare students for online learning. In this module, each student was asked to find results for a given problem related to risk measurement. To complete this assignment, students would learn to navigate the course site, review online documents, open an attached sample report, and use the Class Discussion Board to post their own responses.

Pre-defined roles of Project Members

Instead of letting students define their own roles in the project team, the roles were defined by the instructor before the team was built up. Each project team consisted of four members: a project manager, a risk manager, an insurance analyst, and a financial analyst. Job descriptions and responsibilities of each role were posted on the course site for students to review. Position selection took place in an online discussion forum that contained four discussion threads named after the roles, such as Project Manager, etc. Students were asked to claim their roles by replying to the appropriate thread. Since there was a total of sixteen students signed up for the course, four project teams were to be organized, with only four opportunities available for each role. In other words, once the role of Project Manager, for example, had been claimed by four people, that position was closed. A rule was made clear that "the person with the first date and time claiming a position has priority in the selection process."

Identifying the principal roles needed to complete a design plan is a critical part of the learning process (Bridge, 1992; Johnson & Johnson, 1997; West, 1992). It is also a time-consuming task that requires significant interaction and communication and negotiation among the team members. Considering the overall semester time limit and the amount of content to be covered in the course, the activity of identifying the separate groups was conducted by the instructor instead of the students. Thus, students could quickly find their position and be ready for the forthcoming tasks.

Instructor-built Project Timeline

The combination of the web-based format and project-driven approach doubles the chance for students to lose track of time. So, instead of allowing project team to develop their own individual timeline for their project, a mile-stone chart was shared with the students at the beginning the semester to provided them with a clear understanding of due-dates and deliverables. Within individual modules, there was also a timeline chart that highlighted the time frame expectations for that module.

Researching Design of INS 344

Since collaboration is "the hallmark" of the CPS theory and is built upon interaction (Nelson, 1999), investigating the collaboration and interaction among students within project groups became the main focus of the research. By tracking the quantity and quality of online interaction and by surveying students, the course instructor and instructional designer intended to examine: a) students participation of interaction, b) the effectiveness of interaction, c) students perception of interaction, d) students reaction to CPS, e) students preferences of interaction media, and f) suggestions for improvement.

Students Participation and Interaction

In general, interaction among students in this class was quite intensive with a total of 133 messages posted on the class discussion board. Additionally within the separate group space, the intensity of group interactions was strong in three of the four groups, although as seen in Table 2, the quantity of interaction turned out to be quite unbalanced.

Table 2, Data from Group Page

	Number of Messages Posted	On-line Chat	File Exchange
Group 1	103	5	0
Group 2	86	5	39
Group 3	92	3	2
Group 4	6	0	0

Effectiveness of Interaction
All of the students agreed or strongly agreed (28%) that they learned more by doing the course project collaboratively with other team members than they would have by working by themselves. Comparing with groups in other classes, 53% of the students rated their INS 344 project group as excellent, 33% rated good, and 13%, fair.

Students Perception of Interaction
The survey showed that 60% of the students expected to have the greatest amount of interaction with their team members while 27% expected to interact mostly with their team project manager. One student expected to have the greatest amount of interaction with the instructor and another one chose the textbook as the major interaction object. In reality, 73% of the students said that they ended up having the greatest amount of interaction with their team members while some (13%) doing so with classmates outside their team.

Students Reaction to CPS
When asked, "how do you feel about problem-based-learning as the instructional methodology used?", 93% of the students chose "Favorable" and 7% chose "Very strongly in favor." All but one student was in favor of the course being primarily project driven. Some of the comments made by students in regard to the project:

"loved my group!"

"I liked the course because the project gave me a chance to see a real world thing."

"I liked the structure and the project based learning."

"I really enjoyed the group project for this class. It was really nice to know the group members. This way it was easy to get ahold of them and be able to communicate with them. I know that my group was taking the class to learn and it wasn't just a class to blow off."

" Communicating with member was easy"

"Our Instructor was very helpful, and he put us in groups with people that we all work really well with."

" I liked the group project."

" Got to work on actual real world company."

All the students either agreed (60%) or strongly agreed (40%) that they were motivated by the effort their team members had put into the group project. No one was discouraged by the lack of involvement of any team members. They all believed that their group was able to work effectively as a team and that their team members' contribution were equally distributed. Of their own contribution to the team project, 80% of the students described themselves as "a strong worker with fair amount of input" while 20% called themselves "THE major contributor".

Students Preferences of the Interaction Media
In terms of the communication channels used for interaction, the discussion board was used most extensively, followed by email and then face-to-face meetings.

Suggestions for Improvement
A content analysis from students' feedback offered the following themes:

1) Information & Resource Sharing
   -- Several students indicated that they "had difficulty finding some information" and were "wondering if I was getting a broad enough knowledge base for achieving objectives." Suggestions for improvement include "giving an example of the final project at the start of class" and "post a suggested reading list/schedule." It was also suggested that "(Instructor should) require postings of other group materials, so that we way (will) learn from others."
2) Project Direction, Schedule, and Pace
   -- 53% of the students said that "keeping up the project schedule" had been the most challenging aspect of the course. Some student felt that it is difficult to "complete everything by due dates. It was tough to lay it out at

beginning. Falling behind, then catching up, quite sporadic." One student found it difficult "having to follow a schedule, rather than work at our own pace."

3) Web Access and Navigation
--Learning the structure of the site was found to be difficult by some students. Others encountered technical problems accessing the course and the learning exercises.

Conclusion

As indicated in the Leaner-Centered Psychological Principles (APA Online, 1999), learning can be enhanced when learners have the opportunity to interact and to collaborate with others on instructional tasks. Collaborative problem solving (CPS) provides a theoretical framework for instructors and course designers to build a learning environment that allows for social interactions, and that encourages flexible thinking and social competence. By using the CPS model, the undergraduate business course, INS 344 broke down the traditional lecture-and-exam structure and brought students closer to the real world situation. This approach cultivated a teamwork environment that mirrors the most common and natural situations in the age of information.

This paper outlined the design and delivery of an online business course using Collaborative Problem Solving instructional approach. It has been demonstrated from the learning outcomes and students' feedback that the CPS offered effective instructional methods that were well suited to the content and the context of the course. Also, from analysis of the groups' learning process, it was concluded that there is need for continuing evolvement and more creative usage of the CPS guidelines.

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