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A Pedagogy for Collaborative On-Line Research and Learning: The CORAL Model

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Abstract

The CORAL (Collaborative On-line Research and Learning) model, pedagogy for the use of technology in the classroom, was used by students to learn about group processes and other social psychological topics. Students were enrolled in two different courses at two different universities, and randomly assigned to teams with the assignment of developing and producing a collaborative project. Teams consisted of both same site and distant site members. Students utilized Web Boards, SMART Boards, chat rooms, video-conferencing, file managers, web-based calendars, and email to communicate to other team members to complete course assignments. As students completed assignments they were also required to observe and write about their own group processes in a collaborative analysis. Students learned both course content (group processes and other social psychological concepts) and additional technology and interpersonal skills through the use of this model.

A Pedagogy for Collaborative On-Line Research and Learning – The CORAL Model

Collaborative learning pedagogies are not new and they have consistently advocated an experiential learning approach. We know from extensive research on educational theory that the process of interaction among students is a vital channel for improving learning outcomes (e.g., Beichner, et al., 1999; Chickering & Gamson, 1987; McKeachie, 1994). But the collaborative classroom of today has expanded from individual classrooms to include distant sites. Thus, more recent collaborative learning approaches can utilize technology, including the Internet and videoconferencing, to allow for effective collaboration across distant sites. Computers in particular are a vital component in fostering the collaborative learning process (Chickering & Ehrmann, 1996). Now, synchronous communication tools, such as chat rooms, and asynchronous tools, such as web-based discussion boards, allow for student discussions that serve to bolster active participatory learning in ways not ordinarily available in traditional classrooms (Murray, 1999). But the technology boom of the last 15 years has caused universities to convert traditional classrooms to electronic classrooms with minimal consideration as to which tools best address their goals and the best way they can help students learn, experientially, collaboratively, and otherwise. As is noted in the proceedings from the Forum on Technology in Education (U.S. Department of Education, 1999), "how we use technology in the classroom is more important than if we use it at all" (p. 1). Indeed, "unless our thinking about education is transformed along with increases in the use of technology in our classrooms, our technology investments will fail to live up to their potential" (p. 1).

Indeed, although the success of collaborative pedagogies is well documented there is a great deal of reluctance by instructors to use this approach, especially in higher education. Some

of this reluctance involves students' negative reactions to group work. For example, better students often do not want to work collaboratively with peers because they are afraid poorer students will negatively affect their grade. Poorer students sometimes don't want to work collaboratively because they believe they will be held accountable for poor work produced (Beichner & Saul, 2003). This reticence is multiplied when technology is added to the collaborative model.

Much of the conflict impeding a more wide-spread use of technology-enhanced, collaborative models comes from thinking that online collaboration among students must follow the same format as traditional interaction in face-to-face classrooms (Ehrmann & Collins, 2001). Although many models of distance learning maintain the traditional student-teacher relationship with a set curriculum, the model for electronic collaborative learning fosters autonomy and responsibility, whereby students take more responsibility for their own learning and that of their peers. In essence, they work as a team or community that has been depicted by Shaffer and Anundsen (1993) "...as a dynamic whole that emerges when a group of people share common practices, are interdependent, make decisions jointly, identify with something larger than the sum of their individual relationships, and make long-term commitment to well-being (their own, one another's, and the group's.)" p. 26. Thus, a shift in teacher and learner attitudes and skills is required for online learning to be effective, especially online collaborative learning. In online communication, the focus shifts from being centered on the teacher, to being centered on the students. Both teachers and students who are not prepared for, or previously exposed to, this shift do not know how to 'behave' in a collaborative learning environment.

Although there is reluctance to use collaborative approaches to learning in higher education this type of experiential learning is beneficial to students because such an approach

allows for the strengthening of social skills and self-esteem in addition to better learning of course material (e.g., Beckman, 1990; Chickering & Gamson, 1987). Students learn best in a collaborative environment and retain what they learn for longer periods of time, most likely because they are actively involved in the learning process. Students must assume responsibility for their own learning and the learning of their team members. Furthermore, utilizing a multi-site, technology-enhanced, collaborative approach not only allows for the learning of collaborative skills, but also the learning of technologies that are often used in the current work world, in addition to course content.

The CORAL Model

The CORAL model (e.g., Chamberlin, 2000; Treadwell, 1999; Treadwell, Leach, Kellar, Lewis & Mittan, 1998) is based on the assumption that classrooms should provide places where students have the opportunity to be active collaborative learners working together on specific learning objectives, a goal endorsed by the Forum on Technology in Education (U. S. Department of Education, 1999) and others (e.g., Dede, 2000). The model utilizes the Internet as a collaborative tool connecting university-level students in varied disciplines and at distant sites in an effort to complete a joint project of mutual interest. As Dede (2000) suggests new technological devices can facilitate the presentation of complex subject matter.

Thus, students enrolled in CORAL courses are from two different courses at two different universities and are randomly assigned to teams. Each team consists of both same site and distant site members and is given the specific objective to collaborate on a research project, producing a final document that synthesizes their work on the two different course topics addressed at their respective institutions. In addition to learning course content primary student objectives included to:

1. ***observe the integration and relationship of two course topics.*** In the CORAL model instructors of two different courses (from either the same or different disciplines) allow students to collaborate on topics and assignments designed to be relevant to the course content of both classes.
2. ***improve collaborative skills,*** skills that can be used in many situations and prepares them for the new technology-driven workforce. Students must learn to work together in a team format from distant locations, along with a team mentor. The project guides (see description below) allow students to establish mentoring relationships that students, most likely, have not yet experienced. They also learn to delegate responsibilities through the collaborative project.
3. ***improve interpersonal skills.*** Students interact synchronously and asynchronously with faculty and students at distant sites (e.g., through video conferencing, chat rooms, and/or discussion boards). Video conferencing, in particular, enhances communication between distant site team members and instructors, which in turn promotes team cohesion.
4. ***improve technology skills.*** The use of discussion boards, video conferencing, and chat rooms not only improves interpersonal skills, but also improves technology skills. In the currently described version of CORAL students also learn to use web-based calendars, and a file manager. Students learn to use PowerPoint and Word to report progress of (and complete) their research proposal and final presentation, and on-line search engines to assist in a literature review.
5. ***improve time-management skills.*** Because students have busy schedules and often take multiple courses, they need to discuss each other's schedules in order to organize how they will complete assignments on time. A web-based calendar is especially useful to assist in this process and can be used to post deadlines and chats, for example. It is also useful to help

students work around different school schedules (e.g., spring breaks scheduled at different times at the two sites).

6. ***improve writing skills.*** The use of discussion boards and chat rooms necessitate a clear writing style. The practice students get in writing to communicate to each other compounds with the writing experience they get in preparing their research proposal, progress reports, and collaborative analysis described in the current version of the CORAL model. Even if a CORAL course does not require a research proposal or collaborative analysis, students still gain extensive writing experience through communication efforts.
7. ***improve problem-solving skills.*** Transcending cultural differences, along with negotiation and conflict resolution skills.
8. ***become active learners.*** In this model students are in charge of their own learning. They determine (in the current case) research proposal topic, how they will complete assignments, what tools they will use to complete their assignments, how they will delegate the workload, etc. The instructors and project guides act as facilitators.

Peer Project Guides

CORAL employs the use of undergraduate peer project guides as peer mentors. CORAL project guides are students who have taken a CORAL course in a previous semester and subsequently serve as mentors to those students currently enrolled in the collaborative course. Each team is assigned one project guide who completes a number of tasks throughout the semester. Tasks involved, among others, include modeling on-line communication, answering questions about the use of technology, and encouraging all team members to contribute and communicate. They also make suggestions on where to find resources for the literature review

and what the team should be working on at a particular time. Additionally, they are important in the development of cohesion among the team members.

Tools

Web-Based Discussion Boards. Students complete the majority of the project by writing messages to each other on Web Boards set up specifically for each project team. The Web Board is vital in the project because communication is asynchronous. Students post ideas and ask (and answer) each other questions, which allow them to develop their research proposal. The Web Boards are also used to post drafts of the research proposal allowing team members to give feedback and rewrite these drafts. Team members communicate with one another using their web-based discussion board permitting them to share ideas and foster discussions on various topics related to their research proposal. This effects the teams' communication and collaborative working styles along with being a very powerful tool for team organization and cohesion. It offers team members the capability to view and update postings anywhere they have Internet access.

E-mail. Students occasionally use e-mail to contact team members, although this is secondary to the use of Web Boards. These technologies are also occasionally used by the instructors and project guides to contact team members who are participating less frequently in order to encourage them to become more involved.

File Manager. Fileman is the name of the CGI Script (program) that is running to provide students with a graphical interface to their team account at coral.wcupa.edu. Fileman is similar to Microsoft's Explore program, and the Finder on Macs. It displays the files and directories (aka folders) students make and contains commands to manage files and directories: create, edit, rename, delete, and upload/download files. Student teams house and access drafts of

their project in these CORAL accounts. The version of fileman running at CORAL has been customized for specific CORAL needs. The original version is available from Gossamer Threads at <http://www.gossamer-threads.com>.

Web-Based Calendars. These give each team the ability to keep track of their important dates. Teams can create, edit, and delete events with their web browser. The calendar can send email reminders of future events. The ability to publish team members' schedules or team events online enhances and makes team organization a little less difficult. It offers team members the capability to view and update on-line meeting schedules anywhere they have Internet access.

Chat Rooms. Chat rooms are also utilized by students and provide synchronous communication. Students occasionally (and sometimes frequently such as weekly or twice weekly) will meet and hash out details of the research proposal. The use of Chat rooms is very attractive to team members due to instant communication capability. Chat rooms increase productivity, efficiency, and communication among team members. If a team member is unable to make a chat session the discussion is recorded and can be retrieved for later review.

Web Sites. The CORAL Project has a home page (<http://coral.wcupa.edu/>), where students access information regarding the collaborative course. The home page has been organized to provide (a) an overview of the collaborative project focusing on and defining collaboration, (b) collaborative resources, (c) collaborative team home sites, and (d) the collaborative chat-room (coral reef). Within those four links are specific resources for how to use the technology, the collaborative course syllabus, individual course syllabi for each site, coral tools, coral presentations and research, and collaborative resources that assist students in the completion of the collaborative team projects.

Video conferencing. Videoconferencing personalizes the collaborative team process and encourages cohesion across the two sites. It allows people to communicate face-to-face without tremendous financial costs. Using videoconferencing, teams assemble in their normal electronic or conference room with one or more cameras and microphones. During videoconferences students talk to each other about their projects, demonstrate to each other how to use various software packages, such as PowerPoint, and resolve team conflicts. In addition, teams present assignments during the semester via videoconference utilizing and sharing PowerPoint. Their final collaborative presentations are presented via videoconference using Excel and sharing PowerPoint at the end of the semester.

Final Products

Student teams produce a collaborative research proposal (hard copy and on disk) along with a PowerPoint demonstration of the proposal that is presented at the end of the semester via videoconference. The topic of the proposal has to be relevant to the topics discussed in both collaborative courses, and teams are given feedback on their proposals throughout the semester. The course topic at one university (Clarion University of Pennsylvania) was social psychology; the topic of the course at the second university (West Chester University of Pennsylvania) was a senior seminar on the dynamics of group processes. The topics for the research proposal were chosen by teams and approved by professors only if they were relevant to both course topics. Team papers are added to the CORAL home page (<http://coral.wcupa.edu>) and The National Undergraduate Research Clearing House (<http://clearinghouse.mwsc.edu/>).

In addition to the research proposal students must also complete a collaborative analysis. In the analysis team members observe their own team's behavior and jointly describe the group processes to the project guides and professors, who then give them feedback on the accuracy of

their perceptions and analyses. Students' collaborative analyses are guided by their reading of a number of articles relevant to group, or other social psychological, processes and by answering a number of questions provided to them by the instructors. In essence, students are asked to read articles on group processes or other social psychological topics, define concepts from those articles, and then apply their group experiences to those concepts they have just read and learned about. They use their own group experiences as examples of concepts they are required to learn about in their courses. Each site has their own course content objectives but these are combined in their final collaborative analyses and each site is required to comment upon the work and impressions of the distant site, thereby learning how the two course topics are related.

Sequence of Events

The project has a defined series of events commencing the first class meeting and concluding with the last class during final exam week (16 weeks). The first week of class students are introduced to the collaborative project by their home site professor and project guides. It is made clear that video conferencing is a major communication tool used every class session beginning with the first day. Week one is critical in describing and familiarizing students with technology and organizing the class format. The first class session students:

1. Meet their home and distant site professors, project guides, and fellow students via video conferencing.
2. Are introduced to the CORAL homepage. It is the storeroom for course outlines, collaborative guidelines, communication tools, and collaborative resources.
3. Are assigned to become familiar with the CORAL home page and read a chapter on collaboration for next class; print out hard copies of course outline and due dates.

During the second class students:

1. Are randomly assigned to teams at each home site. The size of the teams varies from semester to semester and a 'workable team' consists of not more than 8 members (4 members at each site). We find that teams of 6 (3 at each site) work best.

2. Exchange E-mail addresses.
3. Are introduced how to use the technology by project guides, including web-browsers, web-based discussion systems (Web Boards) and the Coral Reef (asynchronous chat room).
4. Are assigned to communicate with distant site team members regarding each person's definition of collaboration.
5. Are pre-tested with collaborative scales.
6. Are digitally photographed to make it easier for the distant site to get to know their team members.

The remaining 15 weeks consist of scheduled events/assignments that teams complete which are posted on the CORAL home page.

Week Two through Three. To facilitate development of inter- and intra-site group cohesiveness, students are then required to identify team names, mottos, and logos. Inter- and intra-site cohesiveness is further encouraged utilizing the Tangram Exercise that students complete at each site. The Tangram, an ancient Chinese puzzle, consists of six geometric shapes. Working face-to-face at each site, students are asked to design as many recognizable objects as possible using the Tangram's geometric shapes. When this task is completed, students then must apply that experience to the concepts they read about in the chapter on collaboration and write about the experience in a joint (inter-site) paper. The entire Tangram Exercise encourages students to experience and reflect on working together as a collaborative team and the paper is the teams' first experience writing collaboratively.

Week Four through Six. Teams identify a research topic and submit a written research proposal plan by week five. To complete this, students hold Web Board, videoconference, and chat room discussions to select and agree on a topic of study. Agreement on the topic is vital and usually takes some time. Once an agreement is reached, teams meet via videoconference to present a rough draft of their research proposal topic plan with distant site team members using PowerPoint software. This activity serves a number of purposes allowing students to (a) meet

“face-to-face” so as to encourage team cohesion and eliminate any misunderstandings that arise due to the change in learning format (b) practice and learn PowerPoint before their main presentation at the end of the semester (c) practice presenting together via videoconference and (d) learn project management skills, such as time schedules, and meeting deadlines, utilizing a web-based calendar. Increases in synchronous and asynchronous communication during the early life of a group are associated with an increased likelihood of coming together as a collaborative team. Thus, it is important to balance face-to-face interactions with the more anonymous interactions of cyberspace (Beckman, 1990; Dede, 1996).

Week Seven through Sixteen. After the proposal plan has been presented via videoconference team members begin to compose a research proposal by developing a literature review and hypotheses, creating a methodology to test the hypotheses and predicting possible results. This process takes the remainder of the semester with sections of the research proposal being due during weeks 10, 11, 12, 13, 14 & 15. Time and date flexibility vary with individual teams. The research proposal is completed by week 15.

Students are also introduced to the collaborative analyses during this time. In brief, each team develops a collaborative analysis for each section of the collaborative experience beginning with the Tangram exercise and terminating with the final stage, i.e., presentation of teams’ collaborative experiences. The teams’ experiences in developing the research proposal is the basis for the collaborative analyses, i.e., teams use metacognition to report on their own collaboration and group processes. For each analysis students complete the required reading on social psychological, or group, process topics and then apply their own team experiences to the topics they just read about.

Considerations

Change from Teacher-Oriented to Student-Oriented Approach

We found the CORAL model to be quite effective in both the students' development of course content knowledge, and technology and interpersonal, skills (Treadwell, Ashcraft, McVeigh, & Edmiston, 2003; Treadwell, et al., 2000). However, in order for other professors to utilize this model successfully both instructors and students must be willing to let go of the traditional learning approach whereby instructors transfer their knowledge to students. In the CORAL model students are responsible for their own learning and instructors act as facilitators.

As mentioned earlier, instructors often have difficulty moving from a teacher-oriented to a student-oriented approach. This often is true because teachers tend to teach in the same manner in which they have been taught (Lortie, 1975; Richardson, 1996; Weinstein, 1989). Nevertheless, the benefits, to students, of taking a nontraditional, more student-oriented approach to teaching is well documented. As noted earlier, students learn better in collaborative environments (e.g., Beichner, et al., 1999; Chickering & Gamson, 1987; McKeachie, 1994), and many document the inefficiency of the teacher-oriented approach to learning in a variety of disciplines (e.g., Arons, 1990). The benefits of student-oriented teaching, however, do not just affect students. Using a student-oriented approach to teaching is also beneficial to faculty who will find that by placing more responsibility for learning on the student, classroom time becomes more intellectually stimulating for both faculty and students. Interacting with students on a more individual basis is much more exciting and interesting than lecturing to a class of passive, non-responsive students, as is seeing the students develop and learn as the semester progresses.

Team Development

Part of the instructors' role as facilitator will require that they assist teams in their movement through the various stages of team development: forming, storming, norming, and performing (Tuckman, 1965). As with most task groups there are various developmental phases that teams experience that have been discussed by numerous theorists. The collaborative model follows five basic stages of development that are rather predictable: *forming, storming, norming, performing and adjourning* (Tuckman, 1965; Tuckman & Jensen, 1977). Tuckman and Jensen found it helpful to view each of the stages from two points of view. The first is that of interpersonal relationships. Thus the group will move through predictable stages of testing and dependency (*forming*), tension and conflict (*storming*), building cohesion (*norming*), and finally, establishing functional role relationships (*performing*) before the group adjourns. Each of these sub stages focuses on the problems inherent in developing relationships among members. At the same time, the group is struggling with the problems of task. The initial stages focuses on task definition, boundaries, and the exchange of functional information (*forming*), followed by a natural emotional response to the task (*storming*), a period of sharing interpretations and perspectives (*norming*), before a stage of emergent solutions is reached (*performing*), and before the group adjourns.

It is not uncommon for conflict to develop in stages two and three as members struggle with conciliation of individual differences versus the collaborative objective(s). The conflict is core to the collaborative model and members need to experience how to handle it. If teams do not address this then they do not move to the performing stage. Thus, faculty and students will

both need to be prepared for this eventuality, an experience students don't normally encounter in the traditional classroom, and one which they may be ill-equipped to handle.

Noting team progression through these stages is especially important from a learning perspective. It is during the performing stage that the best collaboration occurs, i.e., a building of ideas by a number of (preferably all) team members occurs. This exchange of ideas results in better products (e.g., solutions, methods, papers – whatever the assignment requires) than would normally occur by an individual. Likewise, products developed, i.e., assignments completed through collaboration, are preferable to those completed through cooperative methods, whereby students divide up work into pieces and each team member is responsible for completing one piece of the assignment, because through this approach students do not learn all aspects of the material that assignment requires.

Staying Focused on Course Objectives

Other considerations for the success of utilizing the CORAL model in other courses, besides those mentioned here, include finding a collaborative teaching partner who teaches a course that might be integrated well with one's own course content. Relatedly, the course assignments designed to help students learn course content are vital to their learning and to students not being caught up in the (collaborative) process without regard for course material. It is possible for students to get so involved with learning to collaborate, and with their team's group processes, that they forget to focus on learning course material, and again instructors might need to intervene should this be the case. Thus, the interpersonal and collaborative skills, which are objectives of the model, will develop naturally through the collaborative interaction and the use of technological tools. However, the readings, and the design of assignments to be integrated and completed jointly by teams, are integral to students learning course content.

Because these collaborative assignments will vary from course to course we see the CORAL model as very applicable to other courses and disciplines. One can imagine foreign language courses taking this approach and integrating upper level language courses with lower level ones; or physics courses partnering with mathematics courses with the science students being responsible for the science involved in their assignments and the math students responsible for completing the mathematics required in assignments; or communication majors working with gender studies students to determine gender differences in communication patterns in video conferences or on discussion boards.

Relatedly, other faculty utilizing similar, but different approaches, in physics education have found that “collaborative, technology-rich, activity-based learning environment[s]” ... have a “substantial positive effect on the students’ conceptual understanding, problem-solving skills, ... and confidence levels” (Beichner, et al, 1999, p. 23). Socialization (i.e., collaborative work) was noted by these researchers as the critical factor in student success. This indicates that our approach, or similar approaches, can be utilized by a variety of disciplines and courses.

A second consideration in utilizing this approach in other courses and disciplines is reducing the emphasis on the collaborative analysis assignment. This is appropriate for the social psychology or group processes courses described here but would not be appropriate for other courses. However, students *must* assess their group processes throughout the collaborative endeavors. As Johnson, Johnson, and Smith (1991) note, one of the key features of successful collaborative learning experiences includes regular self-assessment of group processing. Thus, the collaborative analysis cannot be completely eliminated but can be reduced to assessment exercises whereby students complete peer or team evaluations. They might, for example, describe problems their team has encountered and how those have been resolved. Or students

could evaluate each team members' contributions to assignments, to chat room discussions, to discussion boards, etc. And these assessment instruments must be part of the overall evaluation process. Just as in some more traditional classrooms, class participation is required and graded, collaborative efforts must also be viewed as a course requirement that can also be graded.

Time Considerations

Finally, both instructors and students must consider the time involved in this type of collaborative course. Students do at first feel overwhelmed by the nontraditional course requirements. Faculty do need to reassure them initially. However, we find that students quickly learn the technology needed to complete assignments and very quickly adapt to this learning environment. Many welcome the change in course requirements and relish not having to take exams after memorizing enormous amounts of material. Furthermore, dividing large assignments into smaller workable "chunks" that can then be later integrated reduces students' stress levels. Students probably do spend more time completing assignments for this type of course than they normally would if they were working alone but that is typical of collaborative work and the improvement in the quality of final products, the increases in student learning that occurs, and the retention of material learned by them, more than compensates for increases in time and effort.

Faculty must expect to spend an extensive amount of time developing this type of course, just as one would with an extensive redesign or initial development of a course. However, because this pedagogy is student-centered, in-class effort and preparation is dramatically reduced. Furthermore, once the technology and assignments are developed (including websites, assignment guidelines, etc.), they can be utilized repeatedly each semester the CORAL pedagogy is used, with minimal adjustments. Finally, canned programs such as Blackboard and WebCT

simplify and reduce some of the workload. Beyond this, however, we find that the close interactions with students, the uniqueness of each semester because of different team personalities, and the camaraderie of having a collaborative teaching partner make this type of teaching well worth the effort, keeping us fresh as teachers.

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