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

Thomas Treadwell

West Chester University of Pennsylvania

Donna M. Ashcraft

Clarion University of Pennsylvania

V. K. Kumar

West Chester University of Pennsylvania

Abstract

The CORAL (Collaborative On-line Research and Learning) model is pedagogy for the use of technology in the classroom. This is a pilot study measuring the effectiveness of the collaborative model utilizing many technologies, e.g., Web Boards, SMART Boards, chat rooms, desktop videoconferencing, videoconferencing, file managers, web-based calendars, and email. Students were enrolled in two different courses at two different universities, and randomly assigned to teams who produced a final document. Overall attitudes towards the collaborative model were positive ($M = 2.89$ on a 4 point scale). Students showed very positive attitudes towards the chat rooms and file managers ($M = 3.36$ on a 4 point scale) but reported some difficulty in sharing information with team members ($M = 2.45$ on a 4 point scale). Total cohesion scores and all the subscale scores decreased significantly from the beginning (third or fourth week) to the end of the course (final weeks). However, all of the cohesion sub-scores remained positive through post-test measurement except for scores on task orientation which decreased to $M = 2.08$ from $M = 3.19$ on a 4 point scale. This suggests that greater efforts need to be made to continue the collaborative spirit beyond the first few weeks of the course.

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

Collaborative learning pedagogies are not new and they have consistently advocated ‘a learning by doing approach’. Educational history tells us that collaborative learning has been with us for years and it was only in the late 60’s where individualistic learning began to be used extensively (Peterson, 1952). However, in the 1980’s cooperative learning resurfaced and it was Chickering and Gamson who argued when creating the well-known “Seven Principles for Good Practice in Undergraduate Education” that the process of interaction among students is a vital channel for improving learning outcomes (Chickering & Gamson, 1987). Computers have been considered a part of this composition, according to Chickering and Ehrmann, and have been well recognized as a means of fostering the collaborative learning process (Chickering & Ehrmann, 1996).

Technology, including the Internet and videoconferencing, allow for effective collaboration across distant sites, while promoting the learning and use of the technologies themselves. 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). The technology boom of the last 12 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. 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).

The explosion of technology in the classroom has been accelerated by the Distance Education (DE) movement, an attractive educational option for students allowing them to pursue degrees despite geographic or time constraints (e.g., Freddolino, 1998). While some studies indicate that DE, especially interactive video technology, is equivalent to traditional face-to-face courses (e.g., Huff, 2000; Petracchi & Patchner, 2001), other studies pose concerns regarding technology driven classes. Some common reservations include students feeling isolated from both faculty and other students, minimal face-to-face communication, and software products rendered obsolete "virtually" within a short time. Software glitches and poor student work habits (e.g., forgetting to save work, slow typing,) cause delays, and technology-assisted learning projects require a time commitment (e.g., Abramson, 1998; Altekruise & Brew, 2000; Eamon, 1999; Johnson, 1999; Lewis & Kaas, 1998; Smart, 1999). Others have found site biases, whereby feelings of "us" versus "them" arise (Rooney, Izaksonas, Macy, 1999; Swartz & Biggs, 1999).

Educators using technology are facing many challenges. A shift in teacher and learner attitudes and skills is required for collaborative online learning to be effective. In online communication, the focus shifts from being centered on the teacher, to being centered on the students as a group. 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. Difficult as it may be to implement collaborative learning those who are enthusiastic see improved learning, more effective social skills, and higher self-esteem for the majority of students. Much of the conflict impeding the collaborative model comes from the notion 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 electronic collaborative learning model 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. Involvement in a collaborative work team suggests commitment to working together, understanding individual and team autonomy in the collaborative process, defining purpose of team's objectives, learning how to use distributed leadership and negotiations skills, defining team norms and codes of conduct, developing member roles for task completion, nurturing sub-groups, and allowing for members to resolve their own disputes. In this environment students learn best and retain it longer when they are actively involved in the process (Beckman, 1990; Chickering & Gamson, 1987).

The collaborative model fosters team development through students being placed in work-teams with a common objective. 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.

The CORAL (Collaborative On-line Research and Learning) model is a group-based pedagogy focusing on ‘distributed work teams’ where students share and work with each other in accomplishing a collaborative task utilizing technological tools within an electronic environment. This approach is different from the traditional DE style where instructors utilize technology to deliver their lecture to ‘passive recipients’. The collaborative on-line approach is action based whereby students actively depend on one another to achieve the learning outcomes for the course. A learner in this setting is responsible for developing ideas collaboratively on more or less a daily basis. Active learning has been described by Myers and Jones (1993) as students actively creating knowledge and meaning through experimentation, exploration, along with manipulating and testing ideas in reality. In addition, interaction and feedback from team members, project guides, and instructors assist in determining the exactness and application of ideas. From this perspective, the on-line learning process is learner centered with students taking charge and

shaping the flow as well as direction of the process. Faculty and project guides support this process by assuming the role of facilitator(s), a multipurpose role serving to promote critical thinking, writing, and communication skills.

Communication and collaboration are essentially inseparable. We defined 'electronic collaboration' as an interpersonal communication process that becomes collaborative when team members exercise 'interpersonal labor' in clarifying and understanding each others' roles electronically (forming-storming), coupled with a cooperative effort in accomplishing shared goals (performing) (Brown, Mittan, & Roen, 1997). When there are multiple sites, there is the opportunity to learn not only collaborative skills through working with across-site teams, but also to learn and use technologies that are often used in the current work world.

The CORAL Model

Since 1992, a multidisciplinary collaborative task force has been creating and testing a model for the integration of technology with collaborative teaching and learning (e.g., Chamberlin, 2000; Treadwell, 1999; Treadwell, Leach, Kellar, Lewis & Mittan, 1998). The model is based on the assumption that traditional classroom settings, restructured to incorporate technology, should offer more than information exchange and acquisition of knowledge. As Dede (2000) suggested, new technological devices can facilitate the presentation of complex subject matter (p.1, 7). The model also assumes 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). Therefore, the model developed by this task force 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.

The CORAL (Collaborative On-line Research and Learning) model is a group based model adapting and integrating various aspects of DE, web-based courses, collaborative learning, and traditional face-to-face learning. Throughout the semester, students enrolled in two different courses at two different universities are randomly assigned to teams with specific objectives to collaborate on a research project, producing a final document that synthesizes their work on different disciplinary topics addressed at their respective institutions. Peer project guides are utilized in the course as mentors aiding students in learning the technology and how to collaborate effectively. Web-based discussion boards are the primary means of initiating communication and collaboration between teams. However as the project moves forward, students find that there is a need for increased synchronous tools to expedite and clarify project goals. Thus, videoconferencing, desktop videoconferencing, e-mail, chat rooms, and a file manager, become increasingly critical in enhancing interpersonal communication between sites and teaching the collaborative process.

CORAL employs the use of undergraduate peer project guides as peer mentors. As a key feature of the CORAL model 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 style 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.

SMART Boards: SMART Boards are interactive whiteboards that interface with a computer. Through the use of a projector, faculty are able to demonstrate, to students, on the SMART Boards how to use the various technological tools they will be utilizing to complete their project. Faculty shows students how to use such tools as Netscape or Explorer, the Web Board, and chat rooms. Additionally, students use the SMART Board to write notes collaboratively at one site that will then be posted on the Web Board for review by the distant site and project guide.

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 of 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 in a quadratic fashion to provide an (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 presentation and research, and collaborative resources that assist students in the completion of the collaborative team project.

Videoconferencing: 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

Desktop Videoconferencing: Desktop videoconferencing is a new methodology for videoconferencing. It is "desktop" based. The method for desktop videoconferencing involves participants sitting at their own desks and calling up other participants using their personal computer in a manner much like a telephone. Thus, this is utilized when immediate attention is needed regarding some aspect of their project. On a related note, Web Cams allow for teammates to be able to see, as well as hear each other.

Final Product:

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. The course topic at one university (Clarion University of Pennsylvania; CUP) was the psychology of women; the topic of the course at the second university (West Chester University of Pennsylvania; WCUPA) was the dynamics of collaborative group processes. Thus, in this case, the final product for students was a research proposal on gender as it relates to group behavior. Team papers are added to the CORAL home page (<http://coral.wcupa.edu>) and The National Undergraduate Research Clearing House (<http://clearinghouse.mwsc.edu/>).

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 the collaborative chapter 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 self-evaluation reports of team progress during this time. In brief, each team develops a progress report (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 (adjournment). 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.

The collaborative stages of the teams are predictable and follow five stages of development. Sub-stages focus on problems inherent in developing relationships among team members. At the same time, the team is struggling with the problems of task development. The

initial stage 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 the final stage (*team adjournment*; Tuckman & Jensen, 1977). It is their experiences in these stages that the teams describe in their collaborative analyses. Professors and Project Guides comment on teams' research proposal progress at each stage making suggestions for improvement.

Course Objectives:

A primary goal of the CORAL model is to integrate topics from different disciplines demonstrating how dissimilar subject matters are related to each other. Additionally, the CORAL model has a number of objectives that will be reflected in courses regardless of course topic. These include students:

1. *Improving collaborative skills.* Interpersonal dexterity can be used in many situations and prepares students for the technology-driven workforce. Students must learn to work together in a team format from distant locations, along with a team mentor. Project guides allow students to establish mentoring relationships that students, most likely, have not yet experienced. They also learn to delegate responsibilities.
2. *Improving 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.
3. *Improving technology skills.* The use of discussion boards, video conferencing, and chat rooms not only improves interpersonal skills, but also improves technology skills. Students

learn to use desktop video conferencing, SMART Boards, web-based calendars, and a file manager. Students learn to use PowerPoint, Excel, and Word to report progress of (and complete) their research proposal and final presentation, and on-line search engines to assist in a literature search.

4. *Improving time-management skills.* Students have busy schedules and often take multiple courses, and therefore often need to discuss each other's schedules in order to organize how they will complete assignments on time. The web-based calendar is especially useful to assist in this process and can be used to post deadlines and chats, for example. It also helps students work around different school schedules (e.g., spring breaks scheduled at different times at the two sites).
5. *Improving writing skills.* The use of discussion boards and chat rooms necessitate a clear writing style. The experience student's gain is twofold: Communicating with one another via web-board, chat rooms, and filemanager, and secondly, the writing they experience preparing progress reports, numerous rough drafts and the final version of the teams research proposal.
6. *Improving problem-solving skills,* including negotiating cultural differences (in this case suburban versus rural). Students additionally learn negotiation and conflict resolution skills that are necessitated by the collaborative design of the course.
7. *Becoming active learners.* The CORAL model encourages students to take charge of their own learning. They determine research proposal topic, how they will complete assignments, what tools are needed to complete assignments, how to delegate and share the workload, and they share in the final evaluation of team members performance. The instructors and project guides serve as facilitators.

The CORAL model allows for course-specific objectives. This paper reflects a collaborative course utilizing two courses, psychology of group processes and psychology of women, with activities varying from instructor to instructor and course to course. Thus, the activities used to meet those goals will vary from that described here and will depend upon what courses are being taught. Integration of course topic will most likely involve course goals that are relevant to both course topics and activities. Goals are designed are dependent upon what the integration objectives are.

Comparison to Other Approaches:

The CORAL model differs from other collaborative approaches in a number of ways:

1. The model's flexibility allows it to be used across or within disciplines. Other collaborative approaches are primarily intended for use within disciplines.
2. A significant component of the model is the training of collaboration skills including negotiation, problem solving, and conflict resolution skills. In other approaches there is no such training.
3. It gives students experience in designing a research study and writing a research proposal. Other approaches typically use discussion and communication to improve subject matter learning.
4. It allows students enrolled in different courses to work together, integrating the topics. Other collaborative approaches involve students working only in one class.
5. It allows students at different points in their undergraduate careers to work together, which encourages mentoring. Most other collaborative courses allow only students at the same level and enrolled in the same course to work together.

6. Project guides are not currently enrolled in the collaborative courses. Instead, they have taken the course in a previous semester, and thus bring their experience to mentor/assist other students. They gain valuable teaching experience and professional presentation opportunities. In many collaborative approaches, peers are primarily used to encourage collaboration only among students within a class.
7. Faculty members and project guides assume the role of mediators and facilitators as teams develop from stage to stage.

The Coral model also differs from typical DE courses in the way video technology is utilized. In the CORAL model, students facilitate their own learning via video interactions, learning decision-making skills, and clarifying ideas pertaining to the team's research project through the use of the videoconferencing technology. In contrast, most DE courses employ videoconferencing to deliver talks or lectures, encouraging passive learning utilizing merely one-way communication.

Course Evaluation:

Regarding evaluation of the collaborative course, Palloff and Pratt (1999) suggest two basic forms, formative and summative evaluation. In brief, formative evaluation is an ongoing process that can occur at any point during the course, e.g., our bi-weekly team progress reports and weekly communication evaluations. Summative evaluation assesses the completed course, for example a final paper or exam, to substantiate whether goals have been achieved and learning outcomes established. Formative evaluation of the collaborative on-line course requirements is asked periodically during the semester. This method allows examination of student's perceptions of the course, the collaborative mode of instruction, the on-line environment, and the technology. The CORAL model utilizes both of these evaluative approaches.

Method

Participants

Twenty-two students enrolled in the two previously noted courses were organized in three teams across two sites. The students at Clarion University were enrolled in a 300-level Psychology of Women course and students at West Chester University were enrolled in a 400-level Psychology Senior Seminar course.

Instruments

Collaborative Communication Scale (CCS). The CCS is an 4 point Likert scale ranging from strongly disagree (1) to strongly agree (4) and eight sub-scales examining (a) students' perceptions of project guides, (b) the collaborative model, (c) technology, (d) team development, (e) instructors' knowledge, (f) helpfulness, and (g) participation in a work group.

Group Cohesion Scale (GCS). The GCS is a 4 point Likert scale with five sub-scales measuring (a) member acceptance, (b) information sharing, (c) feelings of sticking together, (d) dependence on a leader, and (e) task orientation.

Design and Procedures

Students completed the Group Cohesion Questionnaire during the first week and again in the last week of classes. For the total cohesion score and all subscale scores, higher scores reflect higher cohesion levels. The Collaborative Communication Scale was completed at the end of the course. Additionally, responses to some individual items were analyzed. Higher scores reflect more favorable evaluations.

Results

Collaborative Communication

Table 1 summarizes the means and standard deviations of the sub-scale item results from the Collaborative Communication Scale. Results show that students were very pleased with the instructors' knowledge and helpfulness ($M = 3.50$ and 3.26 respectfully). The students also strongly felt they had gained insight into participating in a work group ($M = 3.50$). Team development throughout the course was viewed as adequate ($M = 2.89$). In regards to ratings of the technology, students had positive attitudes towards the use of technology and the effectiveness of the technology ($M = 3.16$ and 2.90 respectively). Overall attitudes towards the collaborative model were positive ($M = 2.89$). The one subscale showing negative feelings was the effectiveness of the project guides ($M = 2.18$).

Particular items were examined to see which if any aspects of the model received high or low ratings. It seems that students did not have much difficulty with the “lack of face-to-face communication” ($M = 3.0$). They found photographs helpful ($M = 3.14$). Ratings were positive on both the use of the Tangram Exercise ($M = 2.86$) and team mottos and logos ($M = 2.86$). Students showed very positive attitudes towards the chat rooms and file managers ($M = 3.36$). They reported some difficulty in sharing information with team members ($M = 2.45$).

Group Cohesion

Table 2 gives the results for this analysis. N's varied slightly for different analysis due to missing data. Table 2 shows that the total cohesion scores and all the subscale scores decreased significantly from the beginning (third or fourth week) to the end of the course (final weeks). However, all of the cohesion sub-scores remained positive through post-test measurement except for scores on task orientation which decreased to $M = 2.08$.

Discussion

Overall, the students viewed the CORAL model and its components as effective, although some components were seen as less effective than others. For the Collaborative Communication Scale, negative scores given towards the effectiveness of project guides might be due to a lack of training the project guides received for their role as a peer mentor. Secondly, teaching how to effectively execute the various tasks expected of peer mentors may have been underplayed.

The decrease in the Group Cohesion Scale scores, although contrary to expectations, can be understood within the context of the dynamics of this particular group. The higher pretest scores suggest higher levels of motivation at the beginning of the course than toward the end of the course. That is, student teams worked harder to collaborate early during the first three weeks of the course, but as the work progressed and individual roles became more defined the teams became less cohesive. This was evident in various aspects of the cohesion scale; there was greater mutual acceptance of members, information sharing among the team members, sticking together, and greater task orientation during the initial phase of the course. It is possible, that the initial collaborative efforts resulted in defining various task roles at the beginning of the course. Towards the end of the course however, the students lowered their collaborative and subsequently cohesion efforts possibly through establishing a two or three-member sub-group. Another possibility, a team member became frustrated and completed the work independently. Once assignments were agreed upon, students may have viewed the final presentation as a type of patchwork namely piecing together different aspects of the presentation. It is possible, however, that students are too used to working on their own, rather than truly working collaboratively. Thus, after a period of some collaboration, they end up doing more individual work. These results suggest greater efforts need to be made to continue the collaborative spirit beyond the first few weeks of the course. Another possible contributing factor towards the lowered cohesion

scores might be a lack of direct training of the project guides in their roles as mentors and how to execute them. An increased face-to-face contact between sites and project guide training will help to increase cohesion levels over the semester and increase collaborative efforts.

Implications for Future Research and Use of the CORAL Model

The CORAL model modifies traditional teaching methodology to provide active teaching and learning experiences having wide application. Students' currently work across different geographic locations enabling them to construct knowledge using different resources, skills, roles and relationships. The collaborative approach can be used in courses located within a university, across disciplines, and where faculty work reciprocally with students in preparing them for the workplace. The collaborative model becomes more challenging to implement when students are miles and countries apart. The CORAL model is a good fit for international collaboration that enables students to build local to global multicultural understandings of their human experiences. English as a Foreign Language (EFL) and English as a Second Language (ESL) is becoming less of a barrier as a result of improved technology. Additionally, it could be used effectively for foreign language courses as a way of immersing students in the language culture via videoconferencing in two or more countries. This model is appropriate with individual web-based courses in minimizing feelings of isolation and promoting collaboration in an anonymous teaching atmosphere. Instructional video-technology (ITV) courses can also use this pedagogy to encourage collaboration across sites.

Project guides can serve as a model for on-line student support services and can reduce feelings of isolation students sometimes experience with web-based courses. The model of project guides can be helpful in collaborative web-based DE courses to encourage principally "at risk" students to engage in effective study habits by giving them concrete suggestions on an

individual basis. Project guides or peer mentors appear to be extremely useful in collaborative on line courses and the need for a web-site designed to explain the benefits of peer mentors, the important roles they serve and the selection criteria and process necessary. This would be beneficial to educational, government and business entrepreneurs for training, research and development.

Providing instructors/students with high-tech training, personal computers, telephones, desktop videoconferencing, videoconferencing (ISDN, ATM), and Internet connections is a step toward increasing professionalism. Technology also can reduce isolation and lead to professional communities of educators in cyberspace.

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Authors note

Requests for reprints should be sent to Thomas Treadwell, Department of Psychology,
West Chester University, West Chester, PA 19026.

Table 1.

Collaborative Communication Scale Means & SD (N = 22).

Component	Mean	SD
1. Effectiveness of Project Guides (4 items)	2.18	.92
2. Attitudes toward the Collaborative Model (14 items)	2.89	.29
3. Effectiveness of Technology (e.g., Web Board, Chat Rooms, Tangram exercise, videoconferencing, SMART Board) (9 items)	2.90	.33
4. Adequacy of Team Development (17 items)	2.89	.14
5. Attitudes Toward the Use of Technology (6 items)	3.16	.35
6. Instructors' Knowledge (2 items)	3.50	.62
7. Instructors' Helpfulness (12 items)	3.26	.43
8. Gaining Insight into Participating in a Work Group (1 item)	3.50	.67

Table 2.

Group Cohesion Scale (N=22) Means/per item (4-Point Scale) and Results of Paired-t Tests.

Scale/Subscale	Posttest		Pretest		t	p <
	M	SD	M	SD		
Total Cohesion Score (25 items)	2.77	.30	3.17	.37	-3.72	.001
Member Acceptance (11 items)	2.79	.33	3.24	.39	-4.10	.001
Information Sharing (6 items)	2.90	.36	3.22	.45	-2.63	.016
Sticking Together (5 items)	2.77	.32	3.15	.48	-2.74	.014
Dependence on Leader (4 items)	2.51	.52	2.95	.38	-3.30	.004
Task Orientation (10 items)	2.08	.38	3.19	.41	-2.84	.011