DEGREE OF ONLINE COLLABORATION AND TEAM PERFORMANCE
A Case Study

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This case study investigated the relationship between degree of online collaboration and quality of group project among four teams. Thirteen participants were randomly assigned to form 4 teams to work on 4 collaborative projects across 16 weeks. Two different data sources of discussion archives and quality of group projects were collected and analyzed. Results indicated that there was a strong relationship between the degree of online collaboration and the quality of group projects.

INTRODUCTION

As our society has moved forward, the division of labor has become more obvious. There is very little one person can do alone to make any substantial advances in research and knowledge. The ability to work as part of a team and to coordinate the efforts of a team is becoming more important to the advancement of knowledge and the success of the employee in any job (Johnson & Johnson, 2004). To prepare students for the real work environment, our schools are responsible for promoting collaborative learning and teaching necessary collaboration skills.

Increasing the opportunity for interaction has been identified as a critical component for successful online learning (Moore, 1989; Roblyer & Ekhalm, 2000). Collaborative learning, allowing students to work in groups and encouraging them to share multiple perspectives of views, seems to be a key to promote the interaction between students (Schrage, 1990). In addition, establishing a sense of belonging to a community is essential in a collaborative learning experience (Kirschner, 2004; Palloff & Pratt, 2005).

To study the issue of online group dynamics, Hathorn and Ingram (2002) examined the characteristics of online group collaboration and concluded four different characteristics:

1. *Participation*. Active participation is necessary in order for students to learn

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(Brown, Collins, & Duguid, 1996). When participation is analyzed in online settings, it is often only measured as the number of posted messages (Mazzolini & Maddison, 2003).

2. *Interdependence*. Group members should support each other by making every effort to "listen" attentively and respond quickly. They should offer to share the workload and show commitment to each other. A group cannot function without interdependency, which is a key ingredient of successful online group work (McConnell, 2005).
3. *Synthesis*. The sum of collaboration should surpass what an individuals is able to achieve on his or her own. The negotiation of multiple perspectives leads to novel ideas and creates group synergy (Stahl, 2004).
4. *Independence*. Not relying on instructors for answers is necessary for students to develop problem-solving skills with peers (Kaye, 1992).

Over the past decade, there has been a great deal of interest and research in online collaborative learning. However, research findings on the relationship between educational achievement and the use of online collaborative learning methods are inconsistent (Sonnenwald & Li, 2003; Thompson & Ku, 2006; Uribe, Klein, & Sullivan, 2003). This inconsistency was caused by the complicated nature of collaborative learning and different evaluation standards researchers used to measure collaborative learning. This study extends prior research by focusing on understanding the social dynamics within the group in depth. The research question—What was the relationship of the degree of collaboration to the quality of the team project?—was investigated.

METHOD

Participants

Thirteen female participants were enrolled in an online graduate level course in a special education program in 2008. This course was offered in Blackboard over the span of 16 weeks. The instructor of the course randomly divided participants into four collaborative teams as Team 1 (four members), Team 2 (three members), Team 3 (three members), and Team 4 (three members). All participants had previous online learning experiences.

The composition of the teams changed in the middle of the semester. After the second collaborative project was completed, one member from Team 2 withdrew from the class due to personal reasons. The instructor offered the remaining students in Team 2 the option to continue working as a small team or to join a different team. Both team members chose to discontinue Team 2. One of them joined Team 3 and the other joined Team 4 for the last two collaborative projects. Therefore, Team 2 was disbanded and Team 1, Team 3, and Team 4 each consisted of four members.

Data Sources

This research was conducted as a case study as it categorically fell into the characteristics set forth by Merriam (1998). Two different data sources—discussion archives and group projects—were collected to answer the research question.

Discussion Archives

Participants were instructed to utilize the following online communication tools to work collaboratively for this course: e-mail, group discussion board, and file exchange. If the group decided to use e-mail to communicate with each other, they were instructed to send a copy of their e-mail to the instructor of this course as well as to the first author of this study. Data generated from online communication tools of Blackboard were automatically archived.

Group Projects

Each team had to complete four collaborative group projects for a total of 100 points

throughout the semester. Each of the four group projects was worth 25 points. These four projects were graded by the instructor and a higher score indicated a better project quality. The purpose of this data source was to evaluate the teams' performance in the course.

Procedures

During week 1, students introduced themselves and got to know each other on the discussion board. We posted an online collaboration guidelines document on the discussion board, which set expectations and recommendations for online collaboration. The instructor randomly divided participants into four collaborative teams. In week two, each team reached consensus of how to work collaboratively. From week three to 16, teams completed four collaborative projects, which were submitted in week 6, 9, 14, and 16 respectively.

Data Analysis

Discussion Archives

The coding system used in this study was adopted from Hathorn and Ingram's study (2002), which used the four attributes (participation, interdependence, synthesis, and independence) that were mentioned in the Introduction section.

The first two attributes of collaborative discussion patterns were *participation* and *interdependence*. Participation was measured by counting the number of messages and statements made by each team. Interdependence was defined as the pattern of qualified interaction among team members to bring about active responses to one another. A qualified interaction pattern involved participation of all team members. For example, a simplest qualified interaction pattern among three people could be a-b-c.

a: Shall we include laws to support getting the right services in our paper?

b: Yes, but there were many possible areas to cover the right services.

c: I agree. I think it's important to only cover the right services in educational settings.

If c in the team did not participate in the above discussion, the interaction pattern would be a-b in this case and would not be counted as a qualified interaction pattern. In addition, a more complex pattern of interaction could be demonstrated as a-b-c-x (x could be a, b, or c), which meant not only all three people contributed their ideas to the discussion, but one of them also summarized their ideas or proposed a solution to the problem. The team that generated a higher number of statements and qualified interaction patterns per person demonstrated higher levels of participation and interdependence.

The third and fourth attributes of collaborative discussion patterns included *synthesis* and *independence*. Synthesis of information was measured by counting the number of statements that contributed to generating new ideas. For a demonstration, let's examine the following response from a team member. "I like how you approached this question. We may want to include reasons to go with this law such as the need for highly qualified teachers and specialized training." The first part of her response "I like how you approached this question." acknowledged her team member's work; however, it did not generate any new ideas for the team. In comparison, the reminder of her response was counted as one synthesis statement because a new idea was generated. Independence was measured by the number of messages addressed to the instructor either by e-mail or posting. The team that generated a higher number of new ideas per person demonstrated a higher level of synthesis while the team that addressed fewer messages to the instructor per person displayed a higher level of independence.

Group Projects

Scores of teams' performance on the four projects were obtained from the instructor.

Then the performance was ranked based on the average scores each team received on Projects 1 and 2 as well as the average scores each team received on Projects 3 and 4 due to the change of composition of the team members. A higher score meant that the team produced a better quality project than the team that had a lower score.

RESULTS

Degree of Collaboration

Team 2 was disbanded after Project 2 and the two remaining team members joined Team 3 and 4 respectively for the last two collaborative projects. As a result, the analysis of the degree of collaboration was broken down into two parts, as demonstrated in Table 1: degree of collaboration for Projects 1 and 2 among four teams; and degree of collaboration for Projects 3 and 4 among three teams.

Degree of collaboration was analyzed in terms of participation, interdependence, synthesis, and independence among teams. The level of participation was determined by the number of statements posted on Blackboard. For Projects 1 and 2, Team 1 was the most active team among the four teams. The four participants in the team posted a total of 952 statements (an average of 238 statements per participant). Team 3 was the second most active team. Three participants in the team posted a total of 686 statements, which equals to 228.7 statements per participant. Three participants in Team 2 posted a total of 346 statements, 115.3 statements per participant, which was slightly more than a total of 339 statements from Team 4, 113 statements per participant. For Projects 3 and 4, Team 3 surpassed Team 1 to post the highest number of statements, a total of 675 (168.8 per participant) compared to 663 (165.8 per participant) from Team 1, while Team 4 only posted 219 statements (54.8 per participant).

The level of interdependence among team members was determined by the number of qualified interaction patterns. For Projects 1 and 2, Team 3 generated a total of 18 qualified interaction patterns while Team 1 and Team 4 each generated a total of 15 and 9 qualified interaction patterns, respectively. Team 2 did not generate any qualified interaction patterns at all, revealing the lowest interdependence among four teams. All interactions in Team 2 happened only between two of the three team members, and never was the entire team involved to share ideas or make decisions. For Projects 3 and 4, Team 3 once again generated more qualified interaction patterns than the other teams, a total of 10 qualified interaction patterns compared to 7 from Team 1 and only 1 from Team 4.

In terms of synthesis, for Projects 1 and 2, three participants in Team 3 made a total of 293 statements (an average of 97.7 statements per participant) that helped them generate new ideas and solve problems, while four participants in Team 1 made a total of 352 statements (88.0 statements per participant). A total of 221 statements (73.7 statements per participant) helped Team 4 generate new ideas. In contrast, Team 2 made a total of 69 statements (23.0 statements per participant) that generated new ideas. For Projects 3 and 4, Team 1 made a total of 294 statements (at an average of 73.5 statements per participant) that helped them generate new ideas, which was slightly more than the 292 statements made by Team 3 (73.0 statements per participant). Team 4 did not generate many new ideas for the last two projects; only 62 statements were made (15.5 statements per participant) to generate new ideas.

Lastly, the level of independence was measured by the number of messages each team sent to the instructor. For Projects 1 and 2, Teams 1, 3, and 4 worked almost entirely independently. Team 1 sent two e-mails (0.5 per participant) to the instructor to ask suggestions, Team 3 sent one e-mail (0.3 per participant) to the instructor to clarify instruction, and Team 4 did not contact the instructor at all. In contrast, Team 2 sent a total of 9 messages (3.0 per participant) to the instructor via e-mail and posting, indicating a lower level of independence. They contacted the instructor to clarify project

TABLE 1
Degree of Collaboration

Project 1 and Project 2	*Team 1 (N = 4)*	*Team 2 (N = 3)*	*Team 3 (N = 3)*	*Team 4 (N = 3)*
Total Statements (Participation)	952	346	686	339
Interaction Pattern (Interdependence)	4 a-b 3 a-b-a 4 a-b-c 3 a-b-c-d 1 a-b-a-c 1 a-b-c-a-d 1 a-b-c-c-a 1 a-b-c-a 1 a-b-a-c-a-c 1 a-b-a-b-c 1 a-b-a-c-a-b 10 a-b-c-d-x 15 qualified	21 a-b 8 a-b-a 2 a-b-a-b 2 a-b-a-b-a 0 qualified	7 a-b 3 a-b-a 4 a-b-c 2 a-b-a-c 2 a-b-a-b-c 10 a-b-c-x 18 qualified	7 a-b 2 a-b-a 4 a-b-c 1 a-b-a-b-c 4 a-b-c-x 9 qualified
New Ideas (Synthesis)	352	69	293	221
Message to the Instructor (Independence)	2	9	1	0

Project 3 and Project 4	*Team 1 (N = 4)*	*Team 2*	*Team 3 (N = 4)*	*Team 4 (N = 4)*
Total Statements (Participation)	663	N/A	675	219
Interaction Pattern (Interdependence)	7 a-b 4 a-b-a 2 a-b-c 1 a-b-c-a 1 a-b-a-b 1 a-b-a-c 1 a-b-c-d 1 a-b-a-b-a-c-d 1 a-b-c-a-c 1 a-b-c-a-c-a-d 1 a-b-c-a-b-c-a 1 a-b-c-b-a-c-a-c-b-d 3 a-b-c-d-x 7 qualified	N/A	2 a-b 2 a-b-a 3 a-b-c 2 a-b-c-d 2 a-b-c-a-d 1 a-b-a-b-c 1 a-b-c-a-b-d 1 a-b-c-a-b 5 a-b-c-d-x 10 qualified	4 a-b 1 a-b-c-b 1 a-b-c 1 a-b-a-c-b-c 1 a-b-c-d 1 qualified
New Ideas (Synthesis)	294	N/A	292	62
Message to the Instructor (Independence)	0	N/A	2	3

instructions and file complaints of one team member not doing her share of the work. For Projects 3 and 4, Team 4 contacted the instructor three times (0.8 times per participant) via e-mail about their limited availabilities due to unexpected family situations; Team 3 contacted the instructor twice via e-mail to verify their interpretations of the project requirements

(0.5 per participant); and Team 1 worked entirely independently. In comparison, Team 4 displayed the lowest level of independence.

The ranking for the degree of collaboration was adopted from Thompson and Ku's study (2006) by the sums of rankings for the level of participation, interdependence, synthesis, and independence, and smaller sums indicated higher degrees of collaboration. To rank the level of participation, synthesis, and independence among the teams, all numbers were normalized per participant for each team. To rank the level of interdependence, the total number of the qualified statements generated by each team was used. For the first two projects, the sums of rankings for all four teams were: 8 (Team 1), 15 (Team 2), 6 (Team 3), and 11 (Team 4). Since Team 3 had the smallest sum, it had the highest degree of collaboration among the four teams. Team 1 was ranked at second place and Team 4 was the third. Team 2 had the largest sum and appeared to be the least collaborative among four teams. For the last two projects, the sums of rankings for the remaining three teams were: 6 (Team 1), 6 (Team 3), and 12 (Team 4). Team 1 and Team 3 were both ranked at the top, displaying a higher degree of collaboration than Team 4.

Quality of Group Projects

Each team had to complete four collaborative group projects for a total of 100 points throughout the semester. The team rankings of the project quality were determined by the average of Project 1 and Project 2 as well as Project 3 and Project 4 scores. For the first two projects, Team 1 received the highest average score (24.8), followed by Team 3 (23.8), Team 4 (23.5), and Team 2 (22). For the last two projects, Team 3 received the highest average score (23), followed by Team 1 (21), and Team 4 (20.5).

In terms of degree of collaboration, for the first two projects, Team 3 was the most collaborative team followed by Team 1 and Team 4. Team 2 barely interacted with each other, displaying the lowest degree of collaboration. The results show that the more collaborative teams—Team 3 and Team 1 produced the better quality projects than the less collaborative teams—Team 4 and Team 2. However, the most collaborative team, Team 3, did not produce the best quality projects. The best quality projects were created by Team 1, the second most collaborative of the four teams. For the last two projects, both Team 1 and Team 3 were the most collaborative teams, while Team 4 was the least collaborative team. Both Team 1 and Team 3 produced better quality projects than Team 4. The rankings for all four teams on degree of collaboration and project quality are shown in Table 2.

DISCUSSION

Overall, there is a strong relationship between degree of collaboration and the quality of the collaborative project. Interestingly, Team 3 was more collaborative than Team 1, but Team 1's average score of the first two projects (24.8) was higher than Team 3's average score (23.8). One possible explanation is that Team 1 and Team 3 did not have the same number of team members during these two projects. When being assessed on interdependence, Team 1 of four team members did not have the equal opportunity to reach the qualified statements as Team 3 of only three team members. The probability of an a-b-c-d interaction pattern to occur is less than the probability of an a-b-c interaction pattern. Having teams of different sizes was one of the limitations of this study. It was difficult to conclude who was a more collaborative team between Team 1 and Team 3. However, both Team 3 and Team 1, the two most collaborative teams, produced better projects than Team 2 and Team 4, the two least collaborative teams. For the last two projects, the most collaborative teams, Team 3 and Team 1, produced better projects than Team 4, the least collaborative team.

This study confirmed that a more collaborative team participated more in group discussion, initiated more interactions among team

TABLE 2
Rankings for Degree of Collaboration and Project Quality

Project 1 and Project 2

Team #	*Participation*	*Interdependence*	*Synthesis*	*Independence*	*Degree of Collaboration*	*Overall Ranking*	*Project Quality*
1	1 (238.0)	2 (15.0)	2 (88.0)	3 (0.5)	8	2	1 (24.8)
2	3 (115.3)	4 (0.0)	4 (23.0)	4 (3.0)	15	4	4 (22.0)
3	2 (228.7)	1 (18.0)	1 (97.7)	2 (0.3)	6	1	2 (23.8)
4	4 (113.0)	3 (9.0)	3 (73.7)	1 (0.0)	11	3	3 (23.5)

Project 3 and Project 4

Team #	*Participation*	*Interdependence*	*Synthesis*	*Independence*	*Degree of Collaboration*	*Overall Ranking*	*Project Quality*
1	2 (165.8)	2(7)	1 (73.5)	1 (0.0)	6	1	2 (21.0)
2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	1 (168.8)	1 (10)	2 (73.0)	2 (0.5)	6	1	1 (23.0)
4	3 (54.8)	3 (1)	3 (15.5)	3 (0.7)	12	3	3 (20.5)

members, generated more new ideas through discussion, and solved problems more independently with less guidance from the instructor, and ultimately achieved better learning results. Based on these findings, one recommendation to improve team performance in an online course is to encourage higher degree of collaboration among team members. Strategies such as providing team members with online collaboration guidelines, self and peer evaluation forms, and detailed rubrics will likely maximize the benefits of online collaboration.

In regards to future research, Web 2.0 tools might be an area of interest. Emerging technologies such as wikis and blogs, which encourage user participation, dynamic content, and collective intelligence, have gained popularity among teachers and students. Future research might investigate how to design, implement, and evaluate online collaborative learning using Web 2.0 technologies.

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BOOK REVIEW
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Strategic Applications of Distance Learning Technologies, by Mahbubur Rahman Syed

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Strategic Applications of Distance Learning Technologies, by Mahbubur Rahman Syed (Hershey, PA: Information Science Reference, 2009, 354 pages, $180.00).

Rapid innovation in educational technology has produced tools that have changed the landscape of distance learning. These changes point to both challenges and opportunities for educators and the students they instruct.

From the ubiquitous web browser to more specialized tools (such as virtual learning environments like Blackboard, rich media virtual conferencing systems like Elluminate, all the way to immersive games and simulations) these new technologies both create and respond to the expectation, be it a blessing or a curse, or bit of both, that, like their connections to other media, students' connections to learning experiences be always on and everywhere at once.

Strategic Applications of Distance Learning Technologies, although hard to hold (the book is a large and unwieldy) and sometimes hard to read (its language tends to be quite technical and its chapters fall in no particular order), is a valuable book for two reasons. First, the discussions of projects one finds between its covers give an informative tour of the research being done by scholars working at the intersection of distance learning technology and pedagogy, and offer an overview of the possibilities for teaching these technologies represent. Second, in light of these possibilities, the book raises important questions about the responsibilities distance educators now have, and what best practices we should follow, as we and our students gain access to increasingly rich and interactive learning environments.

The book proceeds from the enabling assumption that web-based, digital technolo-

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gies have come to influence, if not define, the parameters of distance learning and that they will continue to do so. In his introduction Syed writes, "the digital revolution, powered by the engines of information and communication technologies, has fundamentally changed the way people think, behave, communicate, work and earn their living." These changes do indeed run deep; as illustrated by the exponential growth of distance learning programs worldwide, the availability of online learning opportunities has already changed attitudes concerning when and where formal education may occur, and what a learner's relationship to the source(s) of formal education might be.

Taken together, the book's chapters convey a sense of how, thanks to improvements in the technologies of distance learning, it is now possible to help students learn at a distance in ways that were unimaginable as recently as 10 years ago. The book is full of news about tools that provide unprecedentedly rich, immediate, and individually targeted learning experiences. The question of how best to accomplish distance *education*, however, as distinguished from the question of how to accomplish remote *training* or *personal learning*, is a distinct and important one, and one to which fewer chapters in the volume directly respond. Every chapter in *Strategic Applications of Distance Learning Technologies* has something to offer, but most galvanizing are those chapters that do, in some way, point to distinctions between *training* (learning to perform a task), *learning* (the acquisition of new information and the assimilation of that information into the context of one's preexisting personal knowledge and values), and *education* (the development of an expert sensibility negotiated with reference to the normative moral, ethical, social, and intellectual standards of an academic or other professional community) as achieved in online environments.

In chapter 5, for example, a chapter that offers one case of structured instruction done at a distance, authors Müldner, Shakshuki, and Kerren describe the design of an automated tutoring system that helps students of computer programming understand algorithms. The system takes an incremental approach to this instruction: students work through a given programming project one operation at a time, interacting with the system as it offers targeted feedback, when requested, in the form of textual and visual explanations. Student centered, the structured hypermedia algorithm explanation (SHALEX) system at the heart of the experiment provides students with feedback on several levels, keeping global project goals in view while helping students explain and program each operation for themselves. Similar tools, described in other chapters, supply similar support: the purpose of these systems is to provide personalized instruction (sometimes with great sophistication) with respect to predetermined tasks. Feedback is more flexible, and the learning environment more personalized, than has been true in previous generations of such tools; nonetheless, the outcomes of the lesson are predetermined and entail the mastery of basic subject matter, in this case fundamental principles of programming. Assessment involves evaluation of a student's ability to apply these principles as solutions to predetermined problems.

But what if the instruction at hand, the learning to be done, the experience to be gained, does not follow predictable paths? This question, particularly relevant to coursework in the humanities, and equally relevant to advanced studies in any academic discipline, goes unasked in most chapters, simply because those chapters confine themselves to discussions of technical issues or basic instruction in more technical or lower level courses. But what about more ambiguous learning situations, all of whose elements cannot be predicted in advance, and whose outcomes are indeterminate and may be reconsidered after the fact? What about the achievement of *education* in the sense of a process that develops students' awareness of and ability to participate in the intellectual atmospheres of disciplinary and professional cultures on a deeper level of psychosocial understanding? Does *Strategic Applications of Distance Learning Technolo-*

gies offer hope that distance learning technologies may be strategically deployed to achieve such immersive intellectual initiations?

The short answer to this question is yes, but one must at times read between the lines, and between the chapters, to sense it. For example, the authors of chapters 7 and 9 usefully detail scenarios in which information technology (IT) professionals and business pilots, respectively, avail themselves of distance learning experiences for continuing professional development. Emphasizing the personalization of instructional delivery for continued professional development, Fok and Ip, the authors of chapter 7, "An Agent Based Framework for Personalized Learning in Continuing Professional Development," propose an architecture for providing continuing professional development to IT professionals. They persuasively argue that personalized, asynchronous, learner-centered, and at least partially automated training has become a necessity for such workers, noting that the fast pace of technological change has put them under constant pressure to update their skills.

The system Fok and Ip propose includes "personalization features" that match learning resources to the training needs of individual IT professionals. Such features include catalogs of learning objects drawn from the Internet that automatically present the learner with a choice of objects deemed appropriate for that learner based on an analysis of the learner's profile. In addition, the system can also sequence retrieved objects for the learner and monitor the learner's progress, offering formative support as needed. Such a system might appear to be the whole enchilada, the distance educator's holy grail, were it not for one crucial point the authors make themselves: *in order to be meaningful educationally, learning activities must be contextualized with reference to the rules and values of communities of practice*.

A related example of professional training emerges, in chapter 9, from the context of business aviation pilots who maintain their certifications by participating in remotely delivered training programs. The pilots' virtual training grounds make use of two key features of successful online learning experiences recommended in other chapters of this book: real time interaction for feedback and networking, as well as realistic simulations that create conditions in which individualized, active learning may take place.

But here is the point: the activities of the pilots in question gain meaning for taking place in the context of a preexisting professional community. The presence of this context enhances the pilots' training, and contributes to the success of their instruction: it means the social interactions that take place in the virtual learning environment of their training are likely to gain value by virtue of extending into other professional activities, such as professional networking. It also means that the lessons the pilots undertake are always already framed by the professional values and standards of the business aviation industry. In other words, although the pilots connect with the training environment remotely, they know that, when they connect, they operate within an environment informed by the traditions, conventions, and standards of a particular community of practice. The accompanying awareness of larger connections—to the guiding concepts, intellectual and ethical values, and shared objectives of that community, with reference to which the activities of the lesson figure in consequential ways, seems to make all the difference between *training/learning* and *education* with respect to distance instruction.

Detached from the contexts of communities of practice in which they figure significantly, lessons may lead to *training/learning*, but not always to *education*. Some, like the IT professionals and business aviators described in chapters 7 and 9, come to distance learning immersed in the cultures of their industries; they already have it. For other learners, the values, concerns, conventions, and methods characteristic of communities of practice that give learning objects particularized meanings with reference to a program of study, must be made clear by virtue of how they are presented and

the activities that surround them. As Santally and Alain put it in chapter 15, "Personalization in Web-Based Learning Environments," "learning objects are by themselves not teaching objects."

Those who have taught nontraditional students, students who often exhibit a stronger and more focused sense of purpose with respect to their educations than do their traditional counterparts, will recognize how profoundly a strong sense of values and priorities in the learner can increase motivation and the likelihood that a student will find meaning in his or her academic work. Without a sense of how their academic work fits into the culture of a discipline or profession that ratifies his or her program of study, however, even the meanings of a strong learner's learning activities may be limited to a field of personal concerns and fail to connect with other meanings, the student's appreciation of which could be said to constitute the center of his or her *education*, and the internalization of which will define that student as a practitioner in his or her chosen field.

In chapter 3, "Challenges in Delivering Case Based Teaching in the Online Asynchronous Learning Environment," authors Chen, Harris, and Shang voice their concern that a lack of immediacy in communication staged in asynchronous online environments impoverishes that communication from the standpoint of critical thinking and, by extension, of psychological and intellectual engagement on the part of the student. Advocating case method teaching concerned with the investigation of "complex business problems," the authors suggest that students need to experience the social pressure of face-to-face exchanges in order to think rigorously about cases that are multifaceted, indeterminate, and ambiguous. Implicit in this analysis is an appreciation of immediate feedback, which, although emulated by many online instructional architectures, in asynchronous environments, they argue, suffers, as it were, from an absence of presence, fails without the intersubjective confrontation and adaptation, the "in the moment" give and take, required by face-to-face interaction with fellow students and an instructor who is on intimate terms with the social and intellectual standards of the academic or professional community that the students wish to join and which gives particularized significance to the discussion at hand.

Interactions that produce the kind of "cognitive gains" these authors are after are marked by the opportunities they offer students to discover what they themselves think, and to negotiate between their self knowledge and disciplinary knowledge, finding words for their thoughts and feelings that will carry weight in a given discipline or profession. Whereas the authors found these outcomes less prevalent in asynchronous exchanges that took place on discussion boards, in the space created by face-to face-dialog, they saw students make and test their connections and associations, form and reevaluate their stances.

So, does *Strategic Applications of Distance Learning Technologies* offer hope that distance learning technologies may be strategically deployed to achieve immediate and immersive *educational* experiences? The answer (yes) is voiced implicitly by those other chapters that delve into the *synchronous* communication tools the authors of chapter 3 do not discuss (except to say they look forward to experimenting with them), and by those other chapters which consider how the expertise of subject specialists may be introduced, on an interactive basis, into distance learning environments. Chapter 6, "Federated Agent-Based Architecture for Collaborative Education Model," for example, posits a "FedEducation" model for administrating distance learning. Under this model individual schools become homes to particular specializations and join in cooperative networks with other schools to deliver specialized instruction as a component of other schools' programs. Combine this delivery system with the dialogic immediacy of stable and ubiquitous video conferencing as described in chapter 1, "Synchronous E-Learning Integrating Multicast Applications and Adaptive QoS," plus the best

uses of asynchronous technologies (the use of discussion boards for more reflective discussion, for example) and one has a vision of distance learning that comes closer to a general model for distance *education* than we have seen to date.

Clearly, we are still at the ed tech expo in many ways. *Strategic Applications of Distance Learning Technologies* gives one a sense of it. The shopping lists of tools and techniques we derive from its displays will not be permanent, a fact guaranteed by our current rate of technological change. However, guided in our choices by a sense that the instruction we offer should provide students with experiences that connect them, individually, immediately, and immersively, not just in discrete learning activities but in the atmospheres of our professional cultures, we may begin to establish standards by which to judge and select among distance learning technologies to come.