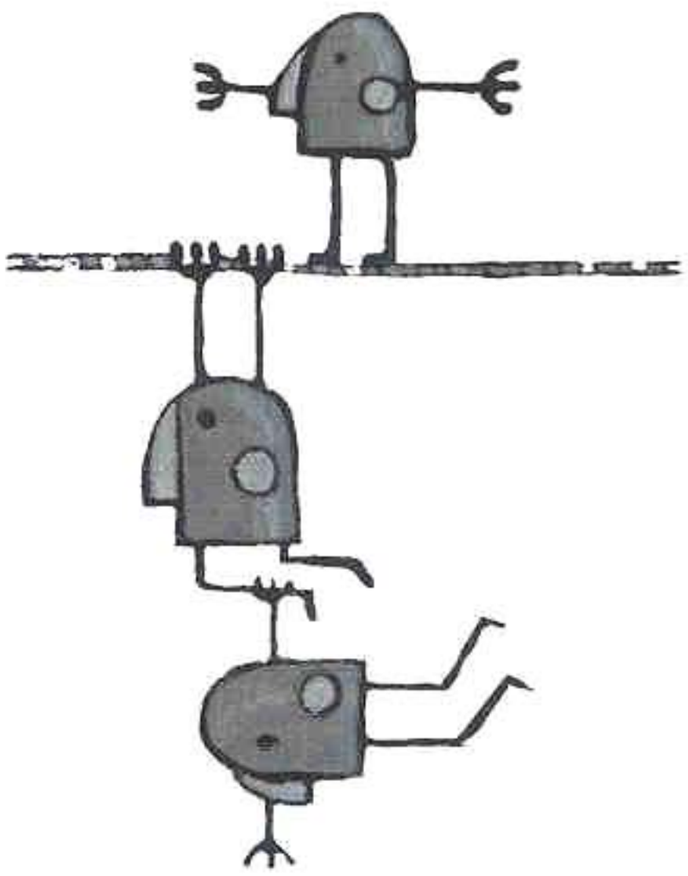
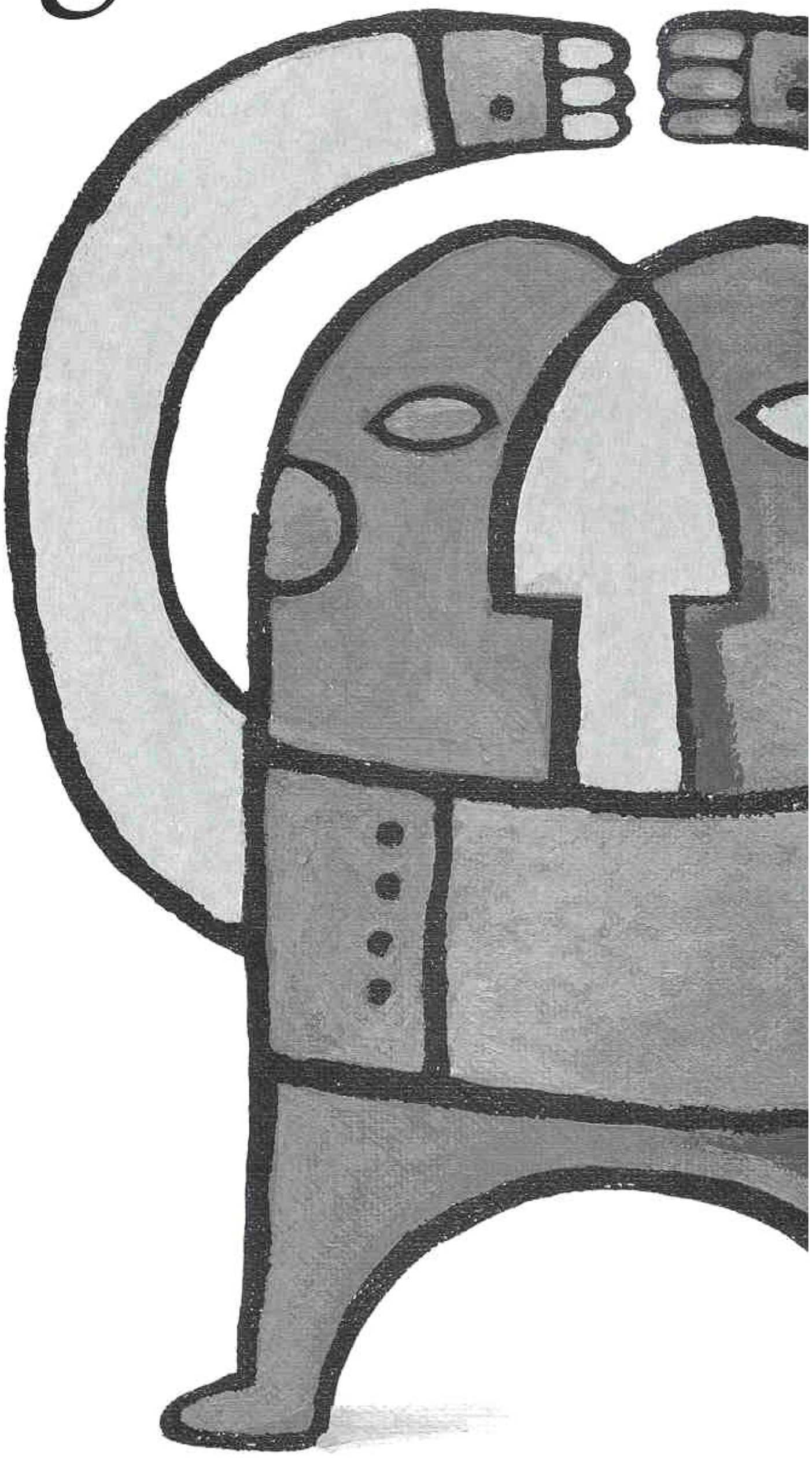
Promoting Reflective

Making the Most of Online Resources in Your Classroom





By Bob Coulter, Cliff Konold, and Alan Feldman

Subject: Teacher planning for telecomputing projects in any subject

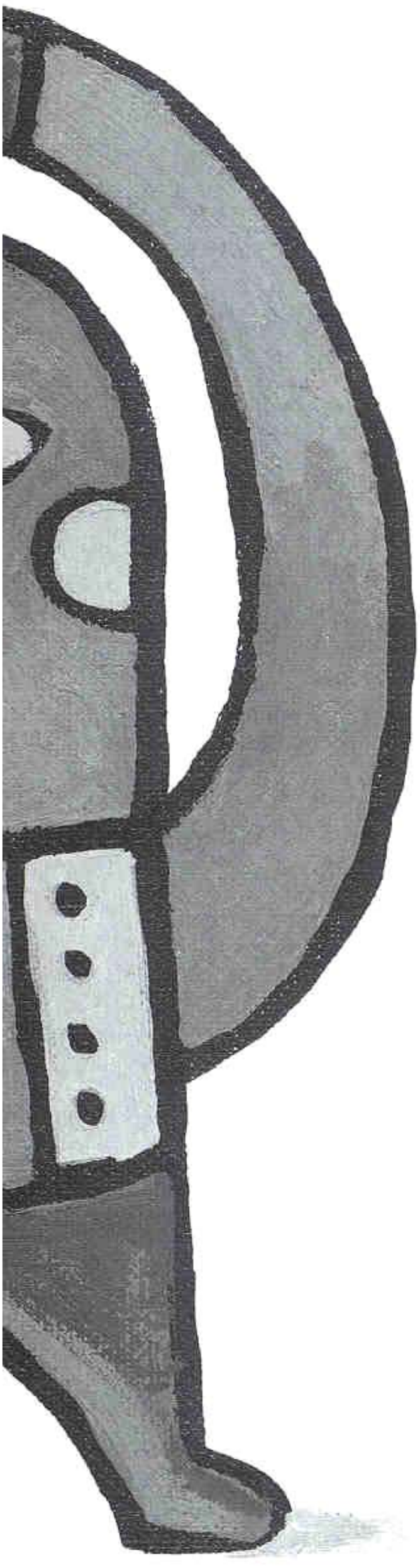
Audience: Teachers, teacher educators

Grade Level: K–12 (Ages 5–18)

Technology: Internet/Web, e-mail, word processing software

Standards: *NETS•S* 4. (Read more about the NETS Project at www.iste.org—select Standards Projects.)

Discussions



As schools provide greater online access for students, teachers and curriculum developers are looking for ways to engage students in discussions with peers at distant school sites and with experts in a field of inquiry. What do we know about the usefulness of these kinds of discussions?

We know that student engagement in discussions is at the heart of the kind of learning advocated in many of the national standards documents (NCTM, 2000; NRC, 1996), which urge that students regularly go beyond factual recall to construct meaning grounded in experience. Such discussions are characterized by students articulating their own understandings, raising questions, and examining others' assertions. In the process, the students go beyond hands-on activities to interpret and reflect on their experiences and develop new understandings of phenomena (Gallas, 1995).

In practice, despite the great hopes many educators hold for students to have such meaningful discussions online, our research indicates that they rarely materialize. Among classrooms participating in network science projects, we found little discussion. Instead, most often we found simple exchanges of factual information. Given our observation that most students did not have the opportunity to engage in such discussions *within* their science classes, it should not be surprising that they have difficulty taking part in such discussions online. (See More on Science and the Internet, p. 48, for more information.)

Participating in a productive discussion requires many subtle skills, including knowing how to phrase ideas clearly and respectfully, how to be a good listener, and how to give constructive feedback. The impersonal medium of typed words—lacking essential nuances such as facial expression and voice inflection—makes the Internet a hard place to learn these skills, even when a skilled moderator is involved.

For these reasons, we believe that the classroom and school are the places that currently offer the best opportunities for students to practice becoming skilled participants in discussion. In making this claim, we don't mean to downgrade the value of the Internet in the classroom; rather, our purpose is to distinguish between uses of the network that are likely to promote learning and those that are not.

In keeping with the ideas developed in last month's article (Coulter, Feldman, & Konold, 2000), we see the Internet as a powerful way to enrich classrooms by giving students access to information resources including current and archival data and subject-matter experts. As these resources are brought into the classroom, students can develop discussion skills as they work together to create an understanding of the information they have collected. The place to foster students' learning, then, is in the classroom as students strive to integrate their firsthand experience and the perspectives offered by remote data and ideas. Through frequent opportunities to debate, question, ponder, conjecture, and prove, students can transform their experiences and the vast amount of information available online

from static, discrete facts into robust conceptual frameworks—the markers of real learning.

The Teacher's Role: Leading Productive Discussions

Though many see the Internet as a tool to improve learning, its use cannot by itself improve anything. A skillful teacher must establish good teaching and learning practices—including effective discussions—in the classroom. Student access to the Internet can never replace the teacher's role. In fact, access to vast amounts of information underlines the importance of the teacher's role in helping students sort and select which information is accurate, reliable, and helpful.

To make these ideas more concrete, we offer an example of how a reflective discussion supports student learning. Bob Coulter was an elementary school science teacher through June 1998. In his fourth-grade class, some students tracked bald eagle migration to compare the migration paths of eastern and western eagles. Every other week, the students downloaded the latest U.S. migration data from the Journey North Web site (www.learner.org/jnorth), mapped the data, and developed preliminary ideas about how the eagles' migrations were similar and different on each coast.

In the process of making these comparisons, students sometimes described the behavior of an individual eagle and used that description to bolster an assertion about how eagles (as a species) behaved. When this happened, another student or the teacher would inevitably counter with a question about whether that behavior was typical or unique to that eagle. Students would then turn to other migration data to make comparisons with eagles on the same coast, on the other coast, or with data from a previous year.

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In the process of working with the data they downloaded, students improved their abilities to refine their assertions, to substantiate them with data, to challenge others' assertions respectfully when they disagreed, and to differentiate between what one eagle did and what was more typical of the species. During the two months they were engaged in this project, students also developed a better sense of scientific inquiry as they became more accustomed to withholding judgment until they obtained further data and modifying their tentative conclusions when data didn't support what they claimed.

In this fourth-grade class, student–student and student–teacher interaction in the discussion supported everyone's learning as students offered conjectures and the class sought to prove or disprove them through careful analysis. Students floated ideas and offered counter-examples. Over the course of the discussion, a more sophisticated understanding of eagle migration emerged.

Thus the students engaged in this project developed their ability to compare and contrast eagle behaviors as they documented and described general trends in the western eagles. These included spending the winter farther north than their eastern counterparts, leaving for the spring nesting grounds earlier, and traveling farther north into Canada during annual migration. Students were also able to document a plausible explanation for this phenomenon as they compared temperatures, finding the western region consistently warmer at comparable latitudes.

The reflective discussion in this fourth-grade class contrasts sharply with more common patterns of classroom interaction. A traditional class usually uses the Initiate-Respond-Evaluate (IRE) process. The teacher selects and poses a factual question (e.g., In which direction do eagles migrate in the spring?) and calls on a student who offers a response. The teacher then evaluates its correctness. Though there certainly are appropriate situations in which the teacher will gauge student understanding of basic factual material, to call such an exchange a *discussion* is to miss the richness of discussions such as the example offered above. (For more on discussions see Feldman, Konold, & Coulter [2000], pp. 79–86.)

More on Science and the Internet

This article is the second of four based on the recently published book, *Network Science a Decade Later: The Internet and Classroom Learning* (Feldman, Konold, & Coulter, 2000). The authors' research focused on "network science"—science curricula that make use of online communities and shared sets of data to support students learning science.

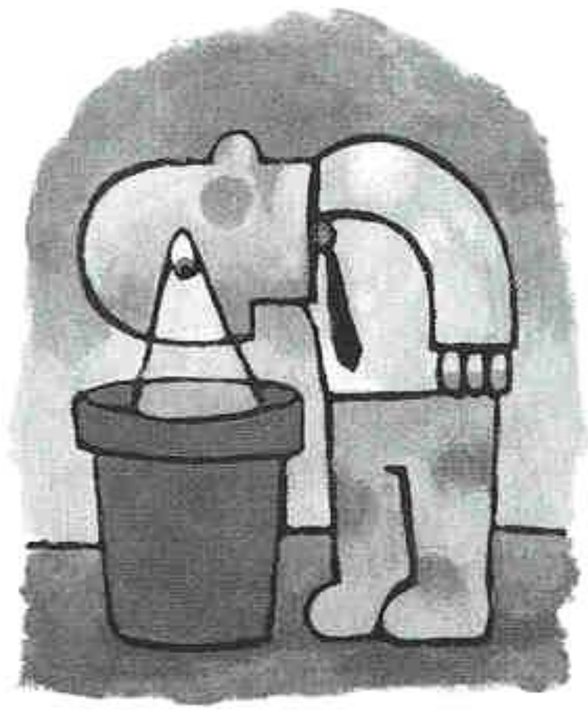
Funded under grants from the National Science Foundation (RED-9454704, RED-9155743, and REC-9725228), their research examined the goals of these curricula and the actual experiences of teachers and students as they participated. Rather than seeing the Internet as a certain road to educational reform, the authors found that the Internet's greatest effects are felt in classes where teachers and students are already engaged in inquiry-based methods of teaching and learning. For more information about the book, see **http://teaparty.terc.edu/book/**.

Typical IRE classroom interactions are most often teacher-directed pursuits of a predefined answer—usefully thought of as a factual exchange rather than a discussion. We suggest that the term *discussion* be reserved for a dialogue that involves the construction of meanings by the participants. Factual exchanges can provide the data or ideas that spark a good discussion, but they are not in and of themselves discussions because the mere accumulation of factual information doesn't constitute learning. It is only through reflection and discussion that discrete facts lead to greater understanding.

Learning to participate effectively in a discussion will be hard work for many of your students, requiring them to learn certain norms that are quite different from typical patterns of classroom discussion. The teacher's role is to establish, model, and reinforce these norms, including:

- listening carefully to one's peers,
- taking responsibility for understanding others' arguments,
- asking for clarification from peers and the teacher as needed,
- demonstrating curiosity and openness to new ideas,
- showing skepticism and insistence on evidence to validate claims, and
- valuing hypothetical reasoning.

These norms suggest that learning to engage in a discussion is not simply a matter of acquiring various discrete, easily measured skills. To a large extent, these norms—values, agreements, and conventions—are at the heart of inquiry, best learned within a group as members negotiate ways of communicating and working with one another in a common pursuit of understanding. Indeed, discussions as we are describing them should not be thought of simply as an optional pedagogic device. Rather, learning a subject well *requires* intensive discourse in that field, whether it be math (Mokros, Russell, & Economopoulos, 1995), science (Gallas, 1995), social studies (Lindquist, 1995), literature (Brady & Jacobs, 1994), or any other discipline.



In practice, despite the great hopes many educators hold for students to have meaningful discussions online, our research indicates that they rarely materialize.

Online Exchanges: Supporting Classroom Discussion

A productive relationship developed a few years ago between two elementary classes participating in Classroom FeederWatch, sponsored by the Cornell Lab of Ornithology (http://birdsource.cornell.edu/cfw/index.html). Separated by hundreds of miles, these classes combined research, field observations, and network communications to enhance students' (and teachers') understanding of birds.

On learning that the feeder put up by Cathy Burge's class in Racine, Wisconsin, was not attracting any birds, Pat Hughes' class in Harleysville, Pennsylvania, arranged to share observations and bird counts from its feeder. The Wisconsin students, in turn, read about and discussed characteristics and behaviors of birds sighted by their partner class in Pennsylvania. They wrote reports of what they had learned and sent copies of these to their partner school.

In one of these reports, the students in Pennsylvania read that mourning doves coo. This prompted some lively discussion, and some doubt, because they had never heard any such sound—they had been watching the birds through their large classroom window. After making additional observations outside, they e-mailed confirmation to Wisconsin that, indeed, mourning doves make cooing sounds. (Burge, personal communication, December 23, 1997; Hughes, personal communication, December 18, 1997)

This exchange was beneficial to both classes. Shared data and information prompted questions and further observations in one class, and in both classes, deeper discussions about bird behavior developed. The students' opportunity to write for an authentic audience and their sense that their work was part of a "real-world" project—not just for a school assignment—no doubt contributed to the success of the collaboration.

Reflecting on the project, Burge credited the collaboration for keeping her and her students involved in the bird study until birds eventually appeared at their feeder (in contrast to another teacher in her school, who abandoned the curriculum after a couple of weeks without any birds at the feeder).

Although the network connection served to keep interest alive, note that according to both teachers' accounts, the significant discussions occurred *within* each of the classes, not between them. The items exchanged—e-mail, reports, drawings, and the like—became valuable resources to aid discussions. As the students in Pennsylvania debated among themselves the issue of whether mourning doves cooed, their teacher helped them develop and internalize the discussion norms. They needed to listen to each other carefully, assume responsibility for understanding others' arguments (in this case, from the students in Wisconsin), and insist on evidence before modifying their beliefs. In this case, they were able to

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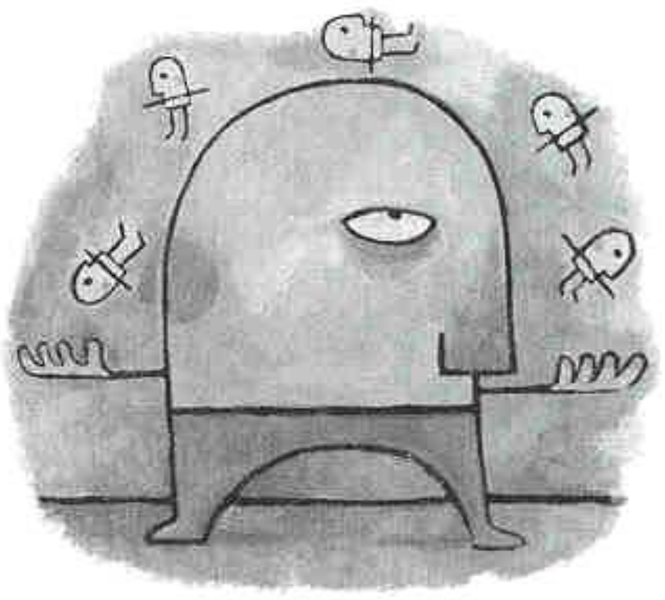
obtain that evidence by modifying their research protocol to include outdoor observations.

Effective Discussions in a Networked World

We all have much to learn about discussions, particularly in the face of rapidly evolving technology. Will faster connections, multimedia communication channels, and design innovations improve the effectiveness of online discussions? When students have more experience engaging in classroom-based discussions, will they develop significantly better skills for participating in online discussions than they have now? Similarly, will teachers develop better skills for leading them?

We acknowledge that our understanding of student and teacher use of the network for discussions is still in its infancy. However, we doubt that faster or more interactive forms of electronic communication will make a noticeable difference in the quality of networked classroom communications. Nor do we believe that online teachers (moderators) will be able to play a role comparable to that of a skillful classroom teacher. Our contention is that the classroom is the best place for discussions to occur and the place where they are easiest to initiate and sustain. It is within a classroom that the teacher can consistently shape discussion norms and the students can learn over extended periods of time.

Ultimately, it is not important that discussions occur online. What is important is that they take place somewhere. When a class is immersed in a productive, thought-provoking inquiry, they will be in the best position to have effective discussions informed by the resources available through the Internet and elsewhere. In so doing, students become active learners who can pull together many discrete pieces of information into robust conceptual understandings. In part three of this series, we will describe how to use data in classrooms and provide guidelines for when and how the use of data can complement good classroom discussions.



The teacher's role in fostering reflective discussions is to establish, model, and reinforce certain norms that are quite different from typical patterns of classroom discussion.

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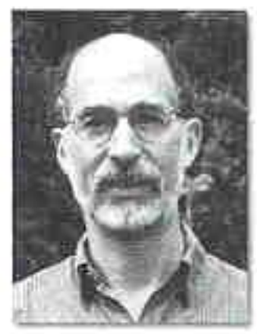

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