The Inquiry Page:
A K-12 Collaboratory Using Socially Intelligent Agents

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Abstract
Socially Intelligent Agents (SIAs) can enhance the ability of the Inquiry Page collaboratory mediators. The central challenge in creating a successful collaboratory is to build and maintain a critical mass of users. To accomplish this, mediators can use strategies and activities that involve, among other things, continuing email dialogs. Many of the activities can be automated as the collaboratory grows.

The Inquiry Page
The Inquiry Page\(^1\) began in 1996 as a class project where teachers could share their lesson units. The philosophy of the Inquiry Page, conflating Dewey’s propositions, is that the curiosity of the child is the chief asset in the classroom. The Inquiry Page is administered by the Inquiry Group, a team of university professors, graduate students, and representatives from the National Center for Super Computer Applications (NCSA). The team meets weekly to update the Inquiry Page, design new ways to use the site, and research its effectiveness. The group is comprised of individuals with expertise in computer science, library and information science, literacy, teacher education, educational psychology, and other sciences.

The Inquiry Group will use software agents as a way to facilitate connections among people, for example, teachers to teachers, teachers to researchers, researchers to administrators. Software agents also allow users to find content resources, curriculum units, research articles, tools, and other materials easily and effectively. Through a variety of mechanisms, the Inquiry Page is serving as the collaboration component for the Inquiry Page Partners, a variety of educational R&D projects. Each of these projects needs a follow-up mechanism to uncover how teachers use their tools and resources. Rather than each partner creating its own follow-up system, the Inquiry Page performs these activities for all of the partners via email correspondence and the creation of Inquiry Units.

Inquiry Units
Inquiry Units (IUs) resemble lesson plans, but are intended as a way for teachers to tell the story behind their successful classroom experiences. A unit describes an area of investigation. It is the “whole” that comprises many types of learning procedures. The Inquiry Group discovered the insufficiency of a one-size-fits-all format for collecting these stories. Thus, HTML cannot provide the needed flexibility. Contact information is collected from teachers using Inquiry Page Partners’ projects and from teachers who visit the Inquiry Page site on the Internet.

Using contact information, the collaboratory mediators establish email correspondence with teachers. Excerpts from the correspondence are formatted into units and classified for a number of purposes. Units that incorporate inquiry-based strategies become Inquiry Units. Partners get follow up on the use of their projects, including exemplary units to be used in workshops and reports. Teachers have a means for finding and sharing successful classroom experiences. Moreover, the Inquiry Page mediators, with the help of SIAs, can link teachers to others with common professional profiles and introduce teachers to resources offered by Inquiry Page Partners. Because IUs focus on classroom successes, they also provide an alternative framework for evaluating success in the classroom, capturing the collective expertise of teachers. In this capacity, portions of the IUs become data for school administrators.

Inquiry Page Strategies
The central challenge in building a collaboratory like the Inquiry Page is achieving and maintaining a critical mass of participating members. Studies have found Computer Supported Cooperative Work systems, such as a collaboratory, that reach and maintain a state of critical

\(^1\) Visit the Inquiry Page at: inquiry.uiuc.edu
mass, are likely to succeed (Dieberger 1999). Critical mass refers to the threshold of individual actions that must be reached in order to produce and maintain a public good.

To enable the Inquiry Page collaboratory to reach critical mass, two strategies are proposed:

- Encourage pro-social behaviors within the collaboratory
- Add value to the collaboratory every time it is used

Prosocial behaviors are actions intended to promote the well being of others. These actions tend to be self-reinforcing (Brief and Motowidlo 1986). Donating resources and help-giving are examples of prosocial behavior (Connolly and Thorn, 1990; Constant et al. 1996). A collaboratory can be designed so that members’ acts of kindness are visible to the entire community as a means of gaining recognition. Recognition can provide a means for social navigation in the collaboratory community, linking members, as well recommending exemplary units.

Donating is both a prosocial act and a value-adding activity. Other value adding activities include adaptive indexing where keywords are accumulated “relatively painlessly” by collecting them from real users under authentic conditions (Furnas et al. 1987). Collecting feedback can also add value to the collaboratory. Every user’s act, even a brief examination of a resource, increases the value of the collaboratory in some way, if only to update a counter. Occasionally extensive feedback might be collected. If this feedback includes information about how a resource was used, it can be converted into a IU. Moreover, acknowledging to users that their feedback has been received, and passing feedback on, maximizes the flow of personalized communication between the collaboratory and its members, reinforcing the community through acts of personal recognition. User requests for resources that fail, meaning that the resource is not contained in the collaboratory, can activate outside searching for that resource on the Internet. The resource can then be “wrapped” and linked to the collaboratory (Knoblock, et al. 1994). Searches can also be captured and stored for other members to use as a form of collaborative browsing (Twidale et al. 1997). Thus the value of the collaboratory is increased by members’ usage.

### Inquiry Page Activities

Table 1, above, presents the first phase of activities that the Inquiry Page mediators, with the help of information seeking agents and SIAs, perform. The activities are:

A1. Maintain administrative databases
A2. Invite casual users to join the collaboratory
A3. Generate initial, editable teacher profiles
A4. Send acknowledgments of contributed resources and units to teachers and administrators
A5. Solicit additional information about units
A6. Fulfill teachers’ requests for units and resources inside and outside the collaboratory
A7. Suggest resources to teachers based on their profiles
A8. Put teachers with similar interests in touch
A9. Provide workspace and tools for joint creation
A10. Provide chat rooms and web boards
A11. Help teachers with collaboratory related technical problems
A12. Conduct formal evaluations of resources and generate evaluation reports
A13. Construct new resources from user responses, queries and feedback
A14. Convert resource files to the most commonly used file types.

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Table 1. Prosocial and value added collaboratory activities performed by the Inquiry Page mediators.
Implementation of the strategies listed in the last section will not only enrich the value of the collaboratory collection by the addition of a information and resources, but will also activate social networks. People within the community can be made more aware of each other’s prosocial behavior. With each communication activity, social ties are strengthened. As the collaboratory reaches critical mass, software agents can assist with many of the mediator activities as illustrated in Figure 1 above.

Each teacher has a Member Agent which:
• maintains a usage history of the teacher’s requests
• records permissions and history of contributed resources

There is one Broker Agent on each server which:
• directs requests for resources
• sends log data to the mediator

A Resource Agent is created for each resource to:
• convert files to universal formats
• create and update the unit keyword index entry
• update the unit feedback elements
• send unit keywords to the Broker Agent

Humans and Mediator Agents (SIAs) share the role of mediator. Humans supervise and train agents to handle a variety of activities. Mediators are responsible for all collaboratory communication, including:
• answering requests for technical help
• requesting and acknowledging contributions
• recommending resources and units
• forwarding recognition as appropriate
• running evaluation processes
• sending feedback to the Resource Agent

Conclusion
Software agents can extend the ability of human mediators in the Inquiry Page collaboratory, making it possible to maintain social connections with a variety of stakeholders through the creation of Inquiry Units.

References


