

Supporting the Development of a National Constellation of Communities of Practice in the Scholarship of Teaching and Learning Through the Use of Intelligent Agents

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Abstract: This paper describes the WebCenter, a CSCL tool being developed to support the Carnegie Academy for the Scholarship of Teaching and Learning Campus Program, an effort to strengthen local communities of practice performing the scholarship of teaching and learning and to create a national constellation of communities of practice that transverses them. The WebCenter provides a suite of groupware tools for the use of Campus Program participants. The WebCenter uses two analysis systems to act as social agents to stimulate activity. First, a collaborative filtering system is used to encourage national and cross-disciplinary collaboration between scholars of teaching and learning. Second, an automated peer-review and invitation system, based on the model of a consensus journal, is being developed for three purposes: to support the development of national consensus on the criteria for assessing the scholarship of teaching and learning, to stimulate the production of scholarship meeting these criteria, and to lend credibility to scholarship published on the WebCenter.

Keywords: agents, groupware, teacher professional development

Introduction

Colleges and universities have often inadequately rewarded excellence in teaching because teaching has been primarily unexamined and private. Teaching has been something confined within classroom walls. Higher education must better document its most important work—helping students learn—by identifying and sharing its best practices. Excellence in teaching must be complimented by the scholarship of teaching and learning. The term "scholarship of teaching" was initially coined by Ernest Boyer, the late Past-President of the Carnegie Foundation for the Advancement of Teaching (CFAT), in his groundbreaking book *Scholarship Reconsidered* (Boyer 1990). Lee Shulman, CFAT's current President, has identified three requirements for transforming excellent teaching into the scholarship of teaching and learning: We must make documented teaching and learning theory and practice publicly accessible, open to peer critique, and available for reuse (Schulman 1998, 5).

The work of faculty currently doing the scholarship of teaching and learning is largely isolated and poorly disseminated. Communities of practice in the scholarship of teaching and learning are primarily local and discipline-specific. Rather than being formally supported by Universities and disciplinary societies, they are often interstitial to the canonical practice of these institutions. The Carnegie Academy for the Scholarship of Teaching and Learning (CASTL) is working to build what Etienne Wenger terms a "constellation of communities of practice" on a national scale which transverses these local communities while respecting the situated nature of knowledge within them (Wenger 1998, 126). CASTL is being built collaboratively by its architects at CFAT and the American Association for Higher Education (AAHE) and by hundreds of educators across the country as what Daft and Weick term an "enacting organization" (Daft and Weick 1984). CASTL, through its widely distributed constituents, is interpreting the environment of higher education and stimulating strategic change in an ongoing, iterative process.

This national effort to expand, value, and interconnect the scholarship of teaching and learning faces many challenges. These include:

- There is no national consensus on the definition of the scholarship of teaching and learning, what activities it includes, and how to evaluate them.
- There is insufficient networking across campuses, disciplines, and types of institutions to build consensus.
- In order to be credible, consensus must be formed through the rigorous process of national peer review.
- In order to be useful, it must provide flexibility to adjust to local needs and emerge from a continuing diversity of local practices.
- In order to be equitable, the conversation that leads toward consensus must be widely accessible and democratic.
- Making space for selectivity, diversity, and a broad base of participation will require a massive volume of inter-institutional and interdisciplinary communication.
- Tracking and recording the conversation is necessary for its examination and use.
- Because the scholarship of teaching and learning crosses conventional academic dividing lines, patterns of scholarly interests shared between individual faculty remain undetected.

Although it cannot affect change alone, CSCL technology that utilizes the Internet provides the only available means to fully address these challenges.

Building a National Constellation of Communities of Practice Through the Internet

To foster and reward the scholarship of teaching and learning, higher education needs both a social and a technological support system. The CASTL supplies the social support. In addition to aiding individual scholars of teaching and disciplinary and professional associations, it features the Campus Program, directed by AAHE. The premise of the Campus Program is that campuses need national support in developing, coordinating and

validating new ideas and new practices of teaching, envisioning them as examined and shared work. Inquiry groups, consisting of both teachers and senior administrators, have been formed on over one hundred and twenty-five participating campuses. These groups are linked to each other through common activities, conferences, and the Internet. A more complete description of the Campus Program is available on the AAHE web site at <http://www.aahe.org/teaching/Carnegie/academy1.htm> .

To meet the challenges of national conversation that the Campus Program supports through use of the Internet, more than a conventional web site is required. The WebCenter offers solutions to each of the challenges previously presented in the following ways:

- The WebCenter provides a centralized, nationally visible forum and clearinghouse for the scholarship of teaching and learning. It employs the web not simply as a medium for publication, but as a venue for communication in which to develop both a common vocabulary of key terms to describe the scholarship of teaching and learning and a comprehensive database of the products of this scholarship.
- Communication through the WebCenter allows teachers from diverse institutional and disciplinary settings to explore each others' scholarship in order to discover new connections. They are able to expand these insights into productive networks through annotating documents to make interconnections explicit and forming interest groups to make them stronger.
- The WebCenter automates the process of peer review, matching newly submitted materials with the Campus Program participants best qualified to assess them and calculating consensus judgements from their reviews. This peer review system is described in more detail below.
- While providing an index of quality through peer review, the system also makes every contribution to the database and discussion forums accessible, so that unconventional approaches which may be powerful in a minority of local contexts can still be located and put into use.
- To promote broad participation, the WebCenter will allow users to contribute products of scholarship in virtually any electronic form and provides tools to make this diversity of formats accessible to as many participants as possible. All of the WebCenter's features operate through any standard Internet browser, software which virtually all participants will already have installed on their computers and feel comfortable using.
- In order to allow participants to filter out information not likely to be of interest to them and to locate the most useful information with minimal time and effort, the WebCenter offers sophisticated and easy to use search and browsing capabilities and allows users to instruct the system to automatically notify them by email when new information of potential interest appears.
- The WebCenter keeps detailed records of all participant activity and maintains a permanent archive of all discussions and documents. Participants will always have the option of anonymity to ensure that their legitimate concern for their privacy does not inhibit them from taking advantage of the system.

- In addition to providing a rich source for research, the records of activity allow the WebCenter's collaborative filtering engine, the Recommendation Center, to recommend participants to other participants who use and rank highly similar sets of online materials. Similar usage may indicate shared patterns of scholarly interest that could lead to fruitful exchanges of knowledge and collaborations.

Functionality of the Web Center

Users enter the WebCenter on the core page, where they are asked to log in. If it is their first visit, they are asked to register themselves to the People directory by providing some basic information about themselves and the institution with which they are affiliated. On the core page, they can read announcement from the Campus Program staff. They may then choose to interact with a number of *entities*. (See Table 1.) They may perform one of three *actions* in order to locate a particular *instance* of an entity with which to work. Once they have selected an instance, they may perform one of five *instance actions* upon it. All actions occur through simple forms within any web browser.

Table 1: Functionality of the WebCenter

<i>Entities €</i>	People	Groups	Reports	Messages	Resources	References	Drafts
	Users of the WebCenter. A variety of information is collected about each new user.	Groups of users who work together. Both campus groups and interest-based groups	The formal reports to be filed by campus groups as described in the Program booklet.	Messages in ongoing conversation of a variety of topics chosen by participants	Documents or programs in any electronic format contributed by users and staff to the WebCenter	Bibliographic references of hyperlinks to external print or electronic resources	Documents posted to the WebCenter for comment and revision by other users or group members
<i>Actions</i>							
Add	Self	New; Add self (with permission)	Members of campus group	New message or topic	Upload (with permission)	Yes	Upload
Browse	Hierarchically by keyword	Hierarchically by keyword	By campus	Threaded Topics	Hierarchically by keyword	Hierarchically by keyword	Hierarchically by keyword
Search	By directory variables	By topic and participant variables	Full text and by type and campus variables	Full text and by metadata variables	Full text and by metadata variables	Full text and by metadata variables	Full text and by metadata variables
<i>Instance Actions</i>							
Annotate	No	No	Yes	Reply	Yes	Yes	Yes
Categorize	Self by keywords	Keywords	Keywords	Threads	Keywords and Review Status	Keywords and Review Status	Keywords
Update	Self only	Creator only	Campus group members	Author only	Add a new version	Author only	Tracked revisions by group

Rank	No	No	By usefulness	By usefulness	By usefulness	By usefulness	By usefulness
Review	No	No	No	For accuracy and importance	For accuracy and importance	For accuracy and importance	No
Notify by email	By search arguments or keyword	By search arguments or keyword	By search arguments or keyword	By search arguments or threads	By search arguments or keyword	By search arguments or keyword	By search arguments or keyword

In addition to tools common to most groupware, the WebCenter includes two powerful "intelligent" agents that analyze user behavior and act as social agents to promote the ongoing development of the national constellation of communities practicing the scholarship of teaching and learning. These are the Recommendation Center and the Consensus Peer Review Server. Both systems perform statistical analysis of records of activity of users to yield information which may then be transformed into knowledge through discourse within the community (Hauser 1999). The Recommendation Center uses collaborative filtering (Konstan et al. 1997; Maltz and Ehrlich 1995; Shardanand and Maes 1995), while the Consensus Peer Review Server, which is still being developed, will use the mathematical techniques for locating consensus within a community developed by Romney, Weller, and Batchelder (Romney, Weller, and Batchelder 1986). Entities—resources, references, people, etc.—remain on the server as they were submitted, unchanged by either of the systems. Only the metadata that describes them in the database is changed, giving users of the WebCenter better peripheral cues about how they should classify and make use of the entities. Both systems work by manipulating the borders within which the entities are enclosed in the WebCenter. These borders are essential resources for users evaluating and selecting information resources (Brown and Duguid 1994). The WebCenter is designed to deploy the heuristic power of these border resources in order to encourage the cross-appropriation between the peripheries of communities of practice essential to global innovation (Spinosa, Flores, and Dreyfus 1997).

All actions on entities performed by users of the WebCenter are recorded in a database. This data is used by a collaborative filtering system in the Recommendation Center to recommend entities of possible interest. The system calculates its recommendations by comparing the user's history of use of the WebCenter with the histories of all other users. The system selects a group of other users who have a similar history of use. They have read and ranked highly many of the same publications, searched for resources in the same categories or using the same set of search arguments, read some of the same messages, etc. This list of people is returned to the user as people with whom they may want to begin conversations to discover productive shared interests. Because these users may be from different institutions and different disciplines, it is unlikely that the user would be able to network with them through conventional means of scholarly communication. The system also generates a list of resources, conversations, publications etc. that members of the similar group of other users have used and rated highly at which the user has not yet looked. These entities are likely to be helpful to the user and may not have been discovered by other means.

When users submit new messages, resources, or references to the WebCenter, they may choose to enter them into the peer review process. The Server is currently being developed based on the theoretical model developed by Stodolsky for a "consensus journal" (Stodolsky 1995), although the computer-supported peer review process may eventually take some other form if the model proves inappropriate to the tasks of effectively distinguishing quality scholarship of teaching and learning, stimulating its production, and assuring that faculty are adequately rewarded for their work. A consensus journal is designed to combine the advantages of peer-reviewed and invitational journals. The Consensus Peer Review Server automates the peer-review and invitation process. First, it solicits anonymous reviews from participants with interests similar to the topic of a newly submitted document. The reviewers composed prose reviews and also rank the submitted piece numerically according to the six general criteria for excellence in scholarship which have been identified through the research of Glassick, Huber, and Maeroff: clear goals, adequate preparation, appropriate methods, significant results, effective presentation, and reflective critique (Glassick, Huber, and Maeroff 1997, 25). Second, after a two-week period, the server calculates a majority and a minority position of consensus amongst the reviewers based on reviewers' numerical ratings of the article being reviewed using the statistical methods developed by Romney, Weller, and Batchelder. The review status of the document will be changed according to the results. If a positive consensus is located, the document is given peer-reviewed status. If a negative consensus is located, the author may choose to revise the document on the basis of the prose reviews and resubmit it or to leave the document as is. If there is no consensus identified, the author has the option to revise, and the reviewers are asked to rank the document again after reading the reviews of others and noting any revisions. When a document is given peer-reviewed status, the system will invite the reviewers closest to the consensus positions to contribute new documents that build upon those reviewed. In this way, the Server works as a persuasive technology by encouraging productive scholarly activity by individuals that helps move the national community towards a stronger consensus (Fogg 1998). The ascription of peer-reviewed status also gives the electronic publication increased credibility that may be important to faculty going through the tenure and promotion process.

Conclusion

The WebCenter is located at <http://aahe.ital.utexas.edu>. A prototype was built in the Spring of 1999, and the Beta release, which includes all the functions discussed above, with the exception of the Consensus Peer Review Server, was made public in late August 1999. We at AAHE and at the University of Texas are excited to begin the crucial work of stimulating the use of the WebCenter by the Campus Program's participants and of assessing the results of that use. The two intelligent systems we are implementing have not been used on this scale before in the academy. We will need to identify appropriate methods for evaluating their effectiveness in stimulating cross-appropriation, collaboration and consensus-building spanning disparate local and disciplinary communities of practice. We will need to determine to what extent these technologies help to build otherwise unlikely relationships between educators and to what extent they can encourage scholars of teaching and learning to produce reflective and rigorous

documentation of the practice of teaching well. From these results, we plan to further develop the WebCenter to better achieve the goals of CASTL and AAHE, and we hope to provide insights useful to other designers of CSCL software that supports the emergence and maturation of informal constellations of communities of practice.

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