Supporting and Tracking Collective Cognition in Wikis

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Abstract: This symposium explores central themes related to the design of specific wiki features to support collective cognition, and presents analyses of wiki use in authentic educational settings. Through the presentation of four different projects, the symposium will take up issues related to the significance of iterative design approaches for aligning social networking technologies with specific contexts, and how these 'tweaks' are in turn generating new activities and emergent forms of collaborative knowledge building. In particular the studies in this symposium all explore different means of representing and tracking group cognition in wikis - tags, chat rooms, social bookmarking, whiteboards, blogs, timelines, and transcripts - based on the shared understanding that fostering awareness of activity at group level can be productive for learning. Methods and findings from these studies have relevance for designing and learning with social networking technologies.

Introduction

The transition from the 20th to the 21st century is metaphorically captured in the term 'networked knowledge society,' a notion that draws attention to how people interact with each other through cultural tools in order to develop and learn (Säljö, 2002; Wertsch, 1998). It is also becoming increasingly clear that a knowledge society requires people to collectively take on challenges that are too demanding for the individual, and that technologies are developed to meet the need for such collective practices. This understanding of the role of collaboration and networked technologies in contemporary knowledge practices, and the challenges that this entails, is the rationale for this symposium on wikis.

Wikis make it possible to coordinate individual agency with small groups and with larger collectives. The potential to support collective cognition through representations of 'local – global' activities in wikis is one of the shared interests among the presenters in this symposium. This interest is grounded in an understanding that fostering awareness of activity at group level - over time - can support knowledge building. As Stahl points out in his paper, knowledge building can more easily be operationalized and studied when products of group work such as discourse and theory statements are made apparent.

The support and tracking of these kinds of collective cognition is accomplished through carefully 'tweaked' design iterations that are informed by analyses of people's interaction and discourse in the authentic use settings, another common approach in the projects. This 'finding' of similar interests and methods in our research suggests that *flexibility in functions and representational forms* are important aspects of social networking platforms like wikis and their appeal as sustainable learning technologies, allowing them to be closely aligned - and realigned - with needs in specific contexts.

About the studies

There are still relatively few scientific studies on the use of wikis (see Lund & Smørdal, 2006 for a recent overview). This symposium presents four different wiki projects developed for various disciplinary subjects at secondary, upper secondary, and university levels. All of the studies have a design/re-design focus, with wiki components added or changed through an iterative process involving analysis of use in naturalistic settings. Analytical approaches and the relevance of such design methods as scenarios, user stories, co-design workshops, and prototypes for the respective projects will be discussed. Empirical material in the studies includes face-to-face interactions as well as chat discourse, collected in the form of video recordings or by tools such as WikiPlayer, described in the paper by Larusson and Alterman. Although the analytical focus of the different studies varies, there is a shared general concern with understanding relations between students' interactions and wiki activity in educational settings, and how these resources are made relevant in knowledge building.

In this symposium, we focus on how wiki technology may be designed to support - and reveal – knowledge building activities that entail local (individual, small group) as well as globally distributed (networked, whole class, and beyond) participation on the part of the students. The aim of the symposium is to contribute to the development of perspectives on the relationship between local and global awareness in

processes of collective cognition, and to explore how these may be used to frame the research and design of wiki technologies for educational purposes. We propose that wiki technology, which affords a collective orientation to knowledge building, has potential in educational settings to prepare learners for future work and societal participation.

Barbara Wasson, Intermedia, University of Bergen, is the discussant for the symposium. The four presentations for this symposium proposal are outlined below.

References

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Extending meaning from museum visits through the use of wikis and mobile blogging

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Abstract: In the past thirty years a large body of museum research has been done on school field trips to evaluate their educational value, analyze the impact of preparation for a field trip, and determine factors that influence learning. It is generally agreed that engaging in 'pre-visit' activities and following up museum impressions in 'post-visit' activities are important for knowledge building. However, for a diversity of reasons, students often arrive unprepared for what they will see in the museum, and post-visit activities rarely move beyond a brief classroom discussion. This is the problem addressed through the design of the project that is presented in this symposium. The project combines wiki, blog and mobile phone applications in the aim of extending encounters with art across classroom and museum settings. The presentation discusses the conceptual framework for the design, the design process, and findings from the pilot project.

Introduction

As early as 1984, Nelson Goodman (1984) reflected on how understandings of art are developed over time through comparison and experience with other works, advocating "means of extending the museum's influence beyond the museum building into the more natural setting – of home and working places" (p. 59). Such interest in 'extending the museum visit' corresponds with the understanding that meaning making in museums enters into visitors' longer learning and identity-forming trajectories taking place outside the museum space. In keeping with increasing awareness of the unique educational role played by museums, outreach programs are also rethinking relationships with schools. Traditionally, lectures, guided tours, and worksheets have been important mediating artefacts used by teachers and curators on museum field trips. Since the mid-1990s, however, museum education curators have also explored the innovative use of digital technologies in their work with schools, and particularly teenagers, developing web-based curriculum plans, designing teen-curated websites, and more recently, generating teen folksonomies through social tagging opportunities. Today, mobile phones are perhaps the most familiar and easily accessible technologies through which museum visitors, particularly teens, are extending their educational experiences, both before, during, and after their visit to a museum.

In this symposium I discuss a project in which a combination of tasks, activities and technologies, including wikis and mobile phones, has been designed to support and extend collective knowledge building across classroom and museum settings. The study builds on previous research on art education and learning technologies in classroom and museum settings, with a particular focus on upper secondary school 'art majors.' However, interest here is not in the individual, creative work with different types of media that constitutes a large part of an art curriculum. Rather, the project addresses how to design technologies that can support high school students in mastering and appropriating knowledge of art history and contemporary art theory through collective knowledge building in direct encounters with art. This disciplinary knowledge is required in order to critically reflect on artworks encountered in museums and galleries, to inform their own artistic practice, and to become legitimate participants in the social language of art.

Designing Gidder

Gidder (Groups in Digital Dialogues) draws on two areas of museum-related research in its design. First, the design of the project as a whole is informed by sociocultural perspectives that have increased awareness of the contrasts between formal learning activities in schools and the nature of inquiries in museums in which motivation, identity, previous knowledge and not least, interaction with authentic artefacts and other assume new significance. Second, in designing applications and combinations of technologies we draw on previous research in museums on the pedagogical use of mobile devices, phones, and social networking software, such as wikis and blogs. These different interests and perspectives, learning-focused on the one hand and design-led on the other, have framed this study.

A class of thirty upper secondary students, their two teachers, and an art museum curator participated in the three-week pilot study in late 2007. The activities were designed based on the pre and post visit model typically used by museums in their work with schools:

- Pre-visit: In advance of the visit, the students work in small groups (two to three) in the classroom to select several artworks from the exhibition that interest them. This initial selection of works is made in the wiki, which contains images and texts provided by the curator, among other resources. The students select works, or aspects of works that they want to explore more deeply at the museum, and write labels for the information they collect prior to the visit. Each group has its own space to work in and to collaboratively develop a presentation of their 'collection.'
- Museum visit: Students are invited to explore the exhibition and their pre-selected artworks. They are encouraged to use their mobile phones to send MMS's with 'labeled' information - video, audio, text, images - to the blog in the wiki to share with the class and to use as a resource for their presentations.
- Post-visit: Back in the classroom the following week the groups use the wiki and information in the blog, which now includes video and audio recordings, text, and images, to discuss and develop their interpretations and presentations.

Other resources and shared spaces in the wiki include a description of the task, help and instructions for using the wiki, links to useful information, and assessment criteria from the teacher. The purpose of the labels is to scaffold the meaning making process by asking student to reflect and articulate the main ideas in their writing entries. These labels then appear in a tag cloud, familiar from wikis such as Flickr. The 'tag cloud' design is also aimed at fostering awareness of meaning making across the different groups, at the collective level, as students 'click' on the labels and make connections with concepts and ideas of others related to specific works of art.

Methods

In the symposium, methods used in the design and development of technological features will be presented, which include ethnographic observations, success criteria, co-design workshops, and user stories. In addition, I present the data collection methods used during the three-week pilot. The class was observed and videotaped during activities in the classroom and on the field trip, and interviews with teacher, curator, and most of the student groups were also conducted. The data corpus comprises approximately thirty-five hours of video and audio recordings, phone, wiki, and blog logs, multimodal texts produced by the students, and field notes. Interaction analysis is the main method used to investigate how knowledge resources, including artworks, texts, discourse, interaction, and technologies, are made relevant in the students' collective knowledge building in each authentic context.

Findings

Findings from the ongoing analysis will be presented in the symposium. Findings include new types of group collaborations in the classroom, deep engagement with art works at the museum, active and personalized use of mobile blogging, and the need to carefully design the timing and sequencing of information that is woven into specific activities and unfolding interactions. Problems of individual assessment, teacher engagement, and the need for alternative technological features in the next iteration of Gidder will also be taken up in the presentation.

References

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For a list of publications from the Gidder project see http://www.intermedia.uio.no/display/Im2/Gidder

TWEAK as pedagogical and technological co-design for collectively oriented practices

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Abstract: In this paper we report on empirical studies where pupils have used wikis when solving tasks in collaboration and on how teachers and researchers cooperate on the re-design of wikis. Based on analysis of these studies we argue for a pedagogical and technological co-design that balance learner exploration and negotiation with more goal directed efforts to bring knowledge advancement more up front in school subjects. We see the technological and social aspects of the design as mutually constituting of the wiki activities that develop and that a main challenge for the students is to align their individual and group contributions to the larger collective. Hence, our design emphasizes social interaction and visualizations of local and global activities. This means that the design includes a space also for the teacher, feedback on activities, and models for pedagogical use of tags, chat facility, and social bookmarking for organizing content.

Introduction

In this paper we report on the TWEAK project, which involves pedagogic and technical co-design of collectively oriented practices. In the TWEAK project we have identified three interrelated goals. Firstly, to match collectively oriented tools such as wikis with tasks that requires collaborative efforts. Secondly, to analyze and support activities where learners engage in and across diverse activities that require local (individual, small group) as well as globally distributed (networked whole class and beyond) participation. The rationale is found in the knowledge society's requirements for people to take on challenges too demanding for the individual. Wikis make it possible to coordinate individual agency with small groups as well as larger collectives, and we argue that such coordination needs to be addressed in the classroom in order to prepare learners for future work and societal participation. By juxtaposing wikis with tasks and activity structures we seek to bring knowledge advancement in and across domains more up front in collaborative applications. English as a foreign language (EFL) and History are our selected domains. We have chosen EFL because it is an international language resource mirroring ongoing communication change. History is chosen because in this subject teachers and learners take on increasingly complex issues concerning our global society and how we relate past experiences to current ones. Thirdly, we address the role of the teacher as a most vital force in designing and supporting activities conducive to knowledge advancement. Studies show that teacher presence and participation in online activities are vital for learners to progress (Darling-Hammond, 1999). However, we see that teachers struggle to participate in activities that are enacted offline and online more or less simultaneously. Often, teachers resort to working offline, leaving the online activities to learners alone.

TWEAK as pedagogical and technological co-design

TWEAK focuses on the relationship between the educational tasks and the functionalities of the technology. This relationship is under-researched but vital for understanding how learners and teachers orient themselves towards a shared learning object (Hampel, 2006, Lund & Rasmussen, in review). In education the purpose of exploiting resources is to respond to a challenge, a problem, or a task that has been designed for a particular educational purpose. We argue that the task is intrinsically linked to questions concerning what resources are picked up by learners and how the resources are used in collaborative activity. If available tools do not facilitate the disentangling of the problem at hand there is simply no need for learners to pick them up. To put it bluntly; if the task can be solved individually, learners will not engage in demanding collaborative and networked activities.

In the TWEAK project we develop new designs and models that balance learner exploration and negotiation with more goal directed efforts to bring knowledge advancement more up front in the school subjects:

- Technologically we re-design a wiki by adding a series of supporting mechanisms that facilitate concept development and domain specific vocabulary (tags, chat facility, social bookmarking). From other types of software we know that such features are conducive to learning. At the same time, it is widely reported that there are individual differences in the abilities of learners to take advantage of

computer tools because the complexity becomes too great for some (Darling-Hammond, 1999). These learners need support and guidance from the teachers.

- Pedagogically we facilitate social agency by increasing: the possibilities for teachers to participate in the wiki. Our studies show that teachers only to little extent find a space for themselves in a wiki. Thus, a careful analysis and development of technological prompts needs to be aligned with a perspective of teacher participation.

Method

We are currently doing longitudinal intervention studies in Norwegian Senior High Schools. They rest on principles of design-based research where interventions are iterative, theory-informed and aim to capture the ecology of the learning situation. Research is carried out in a team involving computer scientists, educational researchers, and teachers at the schools in question. We gather data from multiple levels in order to capture the complexity of wiki knowledge advancement and design; videotaped interaction data, the aggregated log files from the wiki, and audiotaped team meetings. The data is analyzed from a sociocultural perspective in which mediated action is the unit of analysis. In the TWEAK project, such actions are seen as cumulative moves in the design process as well as in the knowledge advancement involving learners and teachers.

Findings

Our analysis shows that tasks were approached, negotiated, and solved locally in a jigsaw-like manner on a small group level, but that learners struggle in aligning their local production with that of the larger, collective knowledge construction. This, we argue, is partly an issue related to the design of the wiki environments. The empirical analysis showed that the teachers lack a space for supporting the students' work in the wiki. We argue that the findings on an empirical level make visible some of the complex relations that exist between agents, tasks, and tools in CSCL environments. Hence, we see a need to align task design with the development of technological features that boost agents' awareness of the different levels of collectivity that are involved in joint knowledge construction so that such practices can be integrated in the repertoire of schooling. Our contribution is then found both in the empirical analysis and the suggested technological and pedagogical co-design as a principle for examining activity on individual, small group and larger, collective levels.

References

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For a list of publications presenting findings from the Tweak project and related wiki research by these authors see http://www.intermedia.uio.no/display/Im2/Complex+challenges+-+collective+responses and http://www.intermedia.uio.no/display/Im2/Tweak

Integrating a wiki into support for group cognition

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The Virtual Math Teams (VMT) project is part of an effort to investigate group cognition—the accomplishment of problem-solving and knowledge-building tasks by small groups, particularly in online, distributed contexts. The VMT environment has recently integrated a wiki component into its text chat and shared whiteboard system. The wiki component serves a number of purposes, such as summarizing synchronous small-group interactions and sharing the results among groups in a knowledge-building community.

We are exploring ways of integrating activities in the different work-space components, such as automating the posting of text from the whiteboard to a wiki page associated with the chat room, allowing collaborative browsing and editing of the wiki from the whiteboard, referencing elements of the wiki from the chat, and facilitating seamless navigation among the components. The wiki pages for chat rooms are automatically linked via categories within a 'wikipedia' for the specific domain of interest to the knowledge-building community.

The VMT system including wiki is currently being used for middle-school, high-school and junior college math students, for masters-level information science students and for research teams. Logs of VMT system usage in these authentic settings are analyzed in considerable detail; to date, about a hundred publications have resulted from research on the VMT system. This symposium contribution focuses on technological design issues stemming from the pedagogical goal of integrating knowledge building at individual, small-group and classroom levels. Detailed analysis of how technology is actually used plays a central role in VMT's design-based research approach.

Designing for Groups and Group Cognition

This paper is about how to design software to support group cognition, i.e., to open a communication space or medium for groups of people to solve problems together and to build shared knowledge. To reflect on the software design process, we build on the approach of human-computer interaction (HCI). HCI as a field has historically been oriented largely toward the relationship between the *individual* computer user and the interface of computer software. Classic HCI studies investigated the effects of different designs of desktop software upon individuals using the software. The theory of HCI was, accordingly, closely aligned with the science of individual psychology. In contrast, we look at human-*human* interaction that is mediated by computer software and by the networking of computers. Software is here seen largely as a technological communication medium which both supports and constrains interaction among groups of users. More precisely, our concern is with the small-group interaction itself, that is, the group processes, rather than the interaction of one individual as such with other individuals in the group. Conceptually and methodologically, this involves a shift from the psychology of mental processes, representations and conceptual change of individuals to the largely linguistic *interactions* of small groups.

This fundamental re-orientation entails a shift from the education of individual minds to knowledge building within groups. The issue changes from tracing effects on students of the transfer of factual knowledge from authorized sources (teachers, textbooks, drill software) to understanding how groups build and share knowledge. This new focus is sometimes termed *collaborative learning*, which includes both how groups increase knowledge and how the individuals within the groups learn concomitantly. We actually prefer the term *knowledge building* to either 'education' or 'learning'. Our preference is partially because the terms 'education' and 'learning' tend to be closely associated with traditional institutions of schooling and with psychological theories of individual minds. It is also due to the fact that one can observe the building of knowledge in products of group work, such as discourse, theory statements and documents; knowledge building can more easily be operationalized and studied. This presentation will discuss studies that we have undertaken recently to take advantage of the social networking phenomenon to promote collaborative learning of domain knowledge in a variety of math discourse settings.

Social Networking and Web 2.0

Software for collaborative learning—like that for workplace learning and community learning—is associated with significant HCI issues, that exceed the difficulties of single-user desktop-interface and web-page design. They call for new theories, assessment tools and principles. They must centrally take into account the interactions among group participants as mediated by the software medium, and not just the interaction of an individual user to an interface. The number of possible combinations of views of the software by different participants at any given time and the variety of interactions possible explodes, making traditional HCI analysis techniques inadequate. Many technical problems and many potential uses of the software are unpredictable and have to emerge from actual usage by *groups* of people under naturalistic conditions. This limits the utility of scenarios, mockups, walkthroughs, prototypes and lab studies as assessment tools—as essential as they may still be to specific phases of the design process.

Despite the difficulties facing the development of effective collaborative learning technology, the potential benefits loom larger than ever. The recent increase in Internet usage, particularly by high school and college students, bodes well for the adoption of new educational technologies. In particular, the popularity of a range of social networking sites and of so-called Web 2.0 interactive technologies has already instilled a familiarity with computer-supported collaboration, its handiness and its benefits

During the past five years, we have been investigating pedagogical, technological and methodological issues related to fostering online discourse among math students. We have developed an approach to *chat interaction analysis* that provides the evaluative component of design-based research of networked group cognition. Most recently, we have been integrating the use of a wiki into our online environment to extend synchronous math discourse by small groups to asynchronous math knowledge building by larger communities over extended time periods.

References

Wiki technology for collaborative learning

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Abstract: At Brandeis, several courses have used a wiki-based collaborative learning environment, the WikiDesignPlatform (WDP), to support class work. The WDP can be coupled with other components, like a mailbox, and it provides a number of features that support navigation, awareness, and help users to organize the wiki site. The WDP automatically produces complete transcripts of the online collaborative activity. With the aid of the WikiPlayer analysis tool students can examine these transcripts, explore different theoretical frameworks while practicing a variety of methods and techniques of analysis. In our talk we will demonstrate both the WDP and the WikiPlayer.

Introduction

At Brandeis, several courses have used a wiki environment called WDP to support class work. The WDP includes features that make it easier for the students to share their work and keep track of how the wiki environment is changing. The WDP automatically produces complete transcripts of the online collaboration. These transcripts can be replayed using the WikiPlayer analysis tool, thus providing a basis for an in-depth detailed view of the students' online collaboration. Using the WikiPlayer, the complex wiki data (transcripts) can be closely examined by an interdisciplinary mix of students, while exploring different theoretical frameworks and practicing a variety of methods and techniques of analysis - ranging from discourse and conversational analysis to interaction analysis. This sort of reflective activity has educational value, especially for interdisciplinary students who are learning about technology. Students interested in design, informatics, library science, human-computer interaction, computer supported cooperative work or educational technology, are examples of those that benefit from the introduction of reflective technology into the classroom. Teachers also benefit from the WikiPlayer as they can easily monitor and evaluate individual student contributions in a collaborative wiki assignment.

WDP

The WDP is a collaborative learning platform that supports both asynchronous and synchronous activities. It is a shared workspace for co-authoring, exchanging ideas, and communicating about joint projects and common interests. The core component of the WDP is a customized MoinMoin wiki. The WDP can be coupled with other components – such as a mailbox, a CVS code repository, and an instant messenger – so as to better support the range of tasks required for a given class. The exact composition of additional components depends on the requirements of the domain activity that the platform will be supporting. The WDP automatically produces complete transcripts of the online activity that occurs on the wiki – a record of events far richer than the traditional "recent changes" history collected by most wikis. Some features and components of the WDP that facilitate navigation, support awareness, and help users organize the wiki site, include:

- *WikiEye* provides a fisheye view of recent activity on the wiki summarizing both editing and reading activities on wiki pages and uploading and downloading of files and emails.
- *Searching*: With a single search the student can access all the materials related to a given topic regardless of the representational form.
- *WikiNewsletter* is an email message that is sent out daily to all subscribers. It is tailored to summarize daily activity on the wiki.
- *WikiStickies:* are "post-it" like notes that users can embed inside a wikipage. They are easily distinguishable from the permanent page text and can be addressed to a specific target audience.
- *Tagging:* Every data type (wikipage, email, and so on), stored on the WDP, can be tagged and the tags can be used as a search criteria.

We have used the WDP in several classes for a variety of educational tasks, for example:

WDP as a class website: The WDP supports the sharing of materials such as lecture notes or paper handouts, as well as scheduling and coordination of class and lab work. A daily newsletter is automatically sent out to the entire class that summarizes any activity on the class website on the previous day.

WDP as a central repository and workspace: Teams of students participating in a design term project used the WDP to share material and develop ideas and code. The WDP was seeded with templates, checklists, and examples that made it easier for the students to do their work. Both students and the instructor used awareness features to monitor the progress of the students on their term project.

WDP as a collaborative blog medium: A prefabricated version of the WDP was given to students as a platform for their weekly online collaborative blogging exercise to discuss the course material.

WDP as a modifiable/extendable platform for cognitively engineering collaborative learning environments: Teams of interdisciplinary students cognitively engineered collaborative learning environments by adding components to the basic WDP platform.

Supporting analysis of WDP transcripts using the WikiPlayer

A course taught in the fall of 2008 focused on collaborative learning. Students read material on frameworks for the analysis of online collaborative activities. In this course, the WDP technology was used as students participated in collaborative blogging exercises, exchanged ideas, and wrote position papers. The WDP automatically produced a complete transcript of the online activity of the students. As a part of their term project for the course, the students analyzed these transcripts using the WikiPlayer.

The WikiPlayer includes a set of components that provide the analyst with a statistical overview of the data as well as the capability to review the transcripts – the goal is to make navigation and data mining of the vast record of the collaborative activity a fast and efficient process. The analyst can initially view the collaboration at a higher-level using a timeline, find a set of events or time periods of interest, and then dig deep into the activity to examine the interaction among the collaborators and how it manifested itself in terms of their online representational work. The sequence of events represented in the transcript can be replayed as if one was viewing videotape: the controller interface allows the analyst to pause, fast/step forward and backward as the wiki transcripts are being "played". Before starting playback, as well as during "replay mode", the analyst can filter the transcripts so only pages of a certain type, or pages authored by certain users, et cetera will be shown. The transcripts are also searchable: given a type of activity (reading or editing) or content-related phrase the controller will move forward to the next occurrence of that activity or phrase in the transcript.

References

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Further information on features and examples of WDP and WikiPlayer functions is provided in (Larusson & Alterman, 2007).