Communications Through Virtual Technology:
Identity Community and Technology in the Internet Age
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4 Communication and interaction in web based learning environments

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Abstract: The development of information technology has slowly changed the way people interact with computers. This change has also reached the learning process: distance learning, where student and teacher are connected by technology instead of a classroom, is becoming a viable option to traditional teaching methods, and is poised for major growth over the next several years. However, understanding how to use the World Wide Web (WWW) to support training and learning activities presents a substantial challenge for the designers and evaluators of this emerging technology. Particularly they have to understand how communication and interaction, two key features of the learning process, are changed by the computer technology. Moreover, they have to explore the possibilities of successfully instructing via networks while proving the learning and cost effectiveness of these innovative systems. Starting from the theoretical background presented in Chapter 2 and 3, we present a framework for the development of web-based learning environments. These tools can be considered a particular form of hypermedia: computer-stored information, which is connected and retrieved via links. An interesting evolution of hypermedia analyzed by the text are *shared hypermedia*, new Internet tools in which different users, who are simultaneously browsing the same web site, can communicate with each other.

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4.1 Introduction

The use of computer technologies to enhance learning began in late ‘60s with the efforts of pioneers such as Atkinson and Suppes [1, 2]. Since that time the presence of computer technology in schools has increased dramatically, and predictions are that this trend will continue to accelerate. In particular, the appearance of Internet-based information and communication technologies is changing how training is being conducted in many colleges, universities and private companies. As noted by Federico [3] “we are in the midst of a paradigm shift in education and training from classroom centric to network centric” (p. 653).

On one side the development of information technology has slowly changed the way people interact with computers. Technological advances have gradually shifted the focus away from computers as such, and toward what people actually do with them. The most evident sign of this change has been the creation of totally new interactive communication environments like Computer Mediated Communication and Computer Supported Collaborative Work made possible by the increasing power and flexibility of today’s information technology [4].

On the other side the merger of computer, communication and information technologies enables multimedia capabilities on the Internet or intranets. Using Internet is possible to complement customary instruction, or to provide entire courses over networks. In addition to users individually pursuing training via home PCs, more and more enterprises are choosing distance learning as an alternative to traditional education methods. A significant amount of Internet adoption has occurred recently in IT firms; systems-integration organizations; companies that use the technology for sales training and human resources applications; the financial and banking industries; and academia.

According to a recent market analysis [5], technology-based training (including Internet-based approaches) represented only 2 percent of the overall IT training market in 1998. By 2003, however, the report predicts it will comprise 14 percent of that market. According to the same research, the number of college students enrolled in distance-learning courses will reach 2.2 million in 2002, up from 710,000 in 1998.

However, understanding how to use the World Wide Web to support training and learning activities presents a substantial challenge for the designers and evaluators of this emerging technology. In fact not only does the use of the World Wide Web not guarantee effective learning [6]. Inappropriate uses of technology may hinder learning. For example, it is well known that students can waste a lot of time surfing the Internet.

Yet many aspects of technology make it easier to create environments that fit the principles of learning [7]. To create successful learning environments the designers and developers have to understand how communication and interaction, two key features of the learning process, are changed by computers. Moreover, they have to explore the possibilities of successfully instructing via networks while proving the learning and cost effectiveness of these innovative systems.

This paper presents a framework for the development of web-based learning environments. A particular focus is given to the analysis of shared hypermedia, new Internet tools in which different users, who are simultaneously browsing the same web site, can communicate with each other.

Given the technical and cognitive skills required by shared hypermedia, the focus of this paper will be higher education. However, anyone interested in the possible use of the World Wide Web in K-12 classrooms, may have a look at the recent paper published by Mark Windschitl [8]. This paper proposes different criteria for developing research questions that have the potential to illuminate our understanding of Web-supported learning in K-12 classrooms. These criteria are then applied to a range of existing Web-supported projects that fairly represent how this technology is being used in classrooms today.

4.2 From Hypermedia to Shared Hypermedia: interaction in information retrieval

4.2.1 Hypermedia: related computer-stored information

The term "hypermedia" refers to an "on-line setting where networks of multimedia nodes connected by links are used to present information and manage retrieval" [3, p. 662]. In fact this term can be considered an umbrella term, referring to any computer-stored information related and retrieved by links.

The World Wide Web is a well-known hypermedia environment that users can access through the Internet by using interactive browsers, such as Microsoft's Internet Explorer or Netscape's Navigator. If the information is textual in the first place, we talk of a hypertext, and if there are certain visual, musical, animation elements or the like included, we talk of a hypermedia [9].

Hypertexts and hypermedia are structured around the idea of offering a learning environment that mimics human thinking, that is, an environment that allows the user to make associations between "concepts" rather than move sequentially from one to the next, as in an alphabetical list. Hypermedia concepts are thus linked in a manner that allows the user to jump from subject to related subject in searching for information. For example, a hypermedia presentation on navigation might include links to such topics as astronomy, bird migration, geography, satellites, and radar.

Using hypermedia, students are no longer forced to follow linear lesson sequences but can choose "… what to view, when to view, for how long to view and how many times to view" [10, p. 104]. Consequently, on-line students, can dynamically adapt the educational experience to their own momentary needs, by directly interacting with hypermedia [11]. Moreover, the concept of hypermedia emphasizes the non-textual component added to a hypertext, such as animation, recorded sound and video, and their integration into a primarily associative system of information saving and accessing.

If learning can be considered the acquisition and reorganization of knowledge structures, hypermedia enable and mimic association of these structures since new nodes can be created and linked to extant nodes. According to Federico [3], "when students are engaged in hypermedia contexts… they are intrinsically modeling the learning process, by making their own knowledge assemblies or associations" (p. 663).

However, some researchers are skeptical about the educational relevance of hypermedia environments. As noted by Large [10], "Linking information may be a necessary condition for learning, but it is not sufficient. Links can be made in many ways, including totally arbitrary ones with little semblance to how people associate ideas" (p. 98). Moreover, enabling learner control assumes that students have sufficient knowledge to select and make optimal links. Unfortunately this is not always true, especially for novices who also have to face the cognitive load required to keep track of their navigational paths.

A possible solution to this problem is the use of artificially intelligent tutors that can adapt navigational paths or guide the learning strategy. For instance, artificial neural systems are now used to develop adaptive intelligent tutors that monitor and guide students' navigational paths [3]. These systems use hybrid cognitive modeling combining a knowledge based system and a finite state automata [12]: the student's current cognitive state is determined by previous behavioral states, that are defined by successfully completed goals or navigational paths taken during the process of acquisition.

However, artificially intelligent tutors cannot substitute for teachers and classmates in providing a social context. It is well known that learning is influenced in fundamental ways by the context in which it takes place [6]. The norms and the sense of community established in the classroom have strong effects on student achievement. Students might help one another solve problems by building on each other's knowledge, asking questions to clarify explanations, and suggesting avenues that would move the group toward its goal [13]. Both cooperation in problem solving [14] and argumentation [15] among students in such an intellectual community enhance cognitive development.

Social opportunities also affect motivation. Feeling that one is contributing something to others appears to be especially motivating [16]. For example, young learners are highly motivated to write stories and draw pictures that they can share with others.

In general, learners of all ages are more motivated when they can see the usefulness of what they are learning and when they can use that information to do something that has an impact on others, especially their local community.

4.2.2 Shared Hypermedia: a new form of Computer Mediated Communication

How is it possible to obtain the advantages of hypermedia without losing the learning support of the social context? A possible answer comes from the integration of some form of computer mediated communication in hypermedia (see also Chapter 2 for an expanded discussion). The commonest form of computer mediated communication used to reach this goal is e-mail. With e-mail in the sender leaves a message in a receiver's electronic letterbox, which the receiver must open before he can read the message. Another more sophisticated type of asynchronous computer mediated communication is Newsgroup, an electronic notice-board on which users can post messages referring to a specific topic or area of interest. Users can read the messages by opening the notice-board and send their own messages in turn. As with e-mail, there is no real-time link between the computers of the interacting subjects.

Unlike asynchronous computer mediated communication, the essential feature of synchronous computer mediated communication is that it does provide a real-time link between computers' users. Although the most often cited example is the video-conference, the most widespread system is Internet Relay Chat (IRC). Internet Relay Chat is a form of synchronous computer mediated communication which enables a group of users (a chat) to exchange written messages and interact with each other in two different ways, by sending a message either to a specified user, or to all members of the chat. One Internet Relay Chat variant of particular interest to communication researchers is MUD - also MOO, MUSH and VEE - [17], "a software which accepts the multi-user link through a certain type of network ... and gives each user access to a shared databank of rooms, exits and other objects. Each user consults and manipulates the databank from inside one of the rooms, see only the objects in that room, and moves to other rooms mostly by using the exits that link them" (p.229).

Even if these communicative environments are mainly used for games, their characteristics attracted the attention of instructional designers [18]. Allowing synchronous conferencing, MUDs permit individuals at different locations to interact and collaborate at the same time within the imaginary space created by them [19]. In general, MUDs serve as environments for students to engage in a wide range of discussion topics with their peers and teachers. By using textual descriptions and metacommands courseware developers and teachers can guide the students through customary knowledge domains and support complex interactions between them.

Usually students feel more secure while involved in MUDs' interactions [18]. On one side, MUDs allow anonymity so that communication and interaction are less inhibitive. On the other side, non-native speakers may feel more confident about posting their work or comments because they have enough time to process their thoughts before joining a discussion or starting an action.

Educational MUDs are an important presence on the Internet [20]. They range from MUDs designed as educational play spaces for children to MUDs for college students in which structured classroom activities happen [21]. For instance, MicroMUSE, also known as "Cyberion City" is an educational play space founded by Stan Lim in 1990 and now reaching 800 members, of which half are children. Other educational MUD efforts have involved older students using MUDs as extensions of classroom activities, for instance in conjunction with composition classes [20].

Dual disadvantages of MUDs from an instructional perspective are they generate copious amount of text and are limited to this medium, thereby reducing the flexibility of delivering [19].

One fairly recent form of synchronous computer mediated communication is the Internet Phone, an Internet Relay Chat mode that replaces written text with voice messages. But, the latest and most interesting forms of synchronous computer mediated communication, especially for its possible use in learning activities (Riva, 2001), are Shared Hypermedia (SHY): new Internet tools attaching computer mediated communication to Web browsing (see Table 4.1 for a list of available SHY).

In SHY, different users, who are simultaneously browsing the same Web site, can communicate with each other and share files or web addresses. Using a simple interface, usually resembling a little remote control (see Figures 4.1 and 4.2), SHY users can get a constantly updated list of all the other online users who are visiting the same Web site.

Table 4.1: Shared Hypermedia tools

Tool	Developer	Website
Cahoots	Cahoots	http://www.cahoots.com
Gooey	Hypernix	http://www.gooey.com
Instant Rendezvous	Multimate	http://www.multimate.net
Odigo	NovaWiz	http://www.odigo.com
Firetalk	Multitude	http://www.firetalk.com
ICQSurf	ICQ	http://www.icq.com/icqsurf

All they have to do is click on any person icon, open a message window, and start the communication. The twist is that the chatters automatically have something in common: the Web page they're reading.

Usually a SHY lets the user conduct group and private chats, exchange information or files, and share the same web pages (for a more detailed characteristics of a typical SHY see Table 4.2).

On any Web site, SHY users can see a list of other users and talk with them on group and private levels. SHY further enhances the user experience by consolidating different form of computer mediated communication (e-mail, Internet Relay Chat, etc.) into one fully integrated interface. Many SHY also have a search engine that can be used to find users with a specific age and/or similar interests. In this way it is really easy to set up a group with a common interest, like Social Psychology; or get online to practice a foreign language with a mother-tongue users.

Figure 4.1: Shared Hypermedia interface (Firetalk)

Table 4.2: Features of Shared Hypermedia tools

One-on-one or multi-user chat (text, audio and video)	Users can make calls to multiple people up to 100/1000 users. In multi-user chat one ore more moderators can control group participation by sharing the microphone. It is also possible to broadcast a radio-style Internet talk show where the host maintains control and invites listeners to participate to the event.
Email (text and voice)	User can send text and voice messages to users who are not online.
Web tour	Users can create their own Web Tour and escort other users through a list favorite web sites.
Search engine	Users can find other users with a specific sex, age and/or similar interests.
Transfer of files	Users can upload and download from other users documents and files.

The most advanced SHYs (i.e., Cahoots and Firetalk) have an option, the *web tour*, very interesting for its possible use in teaching. During a web tour a leader can guide the browsing of a small group of users (usually up to 20), who are forced to follow him, interacting with them in real time. By assembling people with similar interests and surfing habits, this new Internet platform transforms Web browsing into a social activity. In this sense a SHY can be the starting point of community-centered environments that can improve the experience of learning.

Figure 4.2: Shared Hypermedia interface (Odigo)

4.3 A learning community in the Net: creating a shared context meaning

Shared hypermedia (SHY) can be a powerful tool for on line learning. A teacher using a SHY can:

- monitor learners routes through the hypermedia content;
- provide feed back to individuals along their navigational paths;
- guide student's interactions;
- discuss with students about the hypermedia contents, both on-line and off-line;
- share with other teachers their successes and failures.

At the same time students can:

- adapt their learning path to their own momentary cognitive requirements;
- interact with the teacher and other students, if needed;
- obtain guidance or coaching;
- share learning experiences and products (documents, files, etc.).

However SHY, as any community-centered environment, involve norms that encourage collaboration and learning. In particular, to be effective, SHYs have to develop communities of practice [6], an approach that involves collaborative peer relationships and a shared participation of teachers and students in educational research and practice.

What are communities of practice? At the simplest level, they are a small group of people who share a common goal over a period of time. They are not a team, a task force, or an identified group but attend the same course, collaborate on a shared task or work together on a product [22, 23]. More specifically, they are peers in the execution of "real activities." What holds them together is a common sense of purpose and a real need to know what each other knows.

The importance of communities of practice is underlined by the "legitimate peripheral participation" theory of learning [22]. According to Lave and Wenger, learners do not learn abstract knowledge. Instead, they learn how to become a member of a community, whether that community is an office, a shop floor, a high school or a playground. Learners participate at the periphery of community activity and thereby begin to assimilate and adopt the community's viewpoint and language. Learning occurs through practice. As Brown and Duguid [24] point out, "The central issue in learning is becoming a practitioner not learning about practice (p. 48, original emphasis)."

According to Lave and Wenger [22] learners must have legitimate access to the peripheries of communication, e.g., tacit knowledge passed from more experienced people, actual observation of work practices or participation in work-in-progress. At the periphery, they learn what constitutes acceptable practices and how to communicate appropriately [23]. Eventually, they become practitioners and insiders, able to pass on tacit knowledge to other peripheral learners.

However, it is not easy to develop a community of practice using computer mediated communication. The following paragraphs will try to define a theoretical path supporting developers and designer in creating successful SHY.

4.3.1 The characteristics of synchronous computer mediated communication

As we have seen in Chapter 2, synchronous computer mediated communication has special features which distinguish it from other forms of communication. There is a technical reason for these differences. Communication with a keyboard and computer screen takes longer than normal face-to-face communication, and the absence of metacommunicative features like facial expression, posture and tone of voice encourages users to find other ways of making communication as complete as possible.

These limitations make computer mediated communication interaction more rarefied than the kind of interaction that happens in normal conversation [25], in the sense that computer mediated communication uses mainly textual devices (abbreviations and smiles [26] as well as MUD metacommands [27]) to reproduce the metacommunicative features (emotions, illocutionary force) of face-to-face conversation.

In most computer mediated communication environments, and in asynchronous ones especially, two typical features of face-to-face conversation are missing [28]:

- the collaborative commitment of participants and the co-formulation of the message;
- the feedback which allows the social meaning of the message to be processed immediately.

In addition, computer mediated communication in no way guarantees that an user's declared identity is the real one. The use of false identities, often of a different sex, is widespread in electronic communities and in MUDs especially [27, 29, 30].

In this sense, we defined computer mediated communication in Chapter 2 example of virtual conversation [25], i.e., a necessarily “pared-down” or, more precisely, rarefied form of conversation which lacks the rules on which effective interaction depends. Computer mediation creates an asymmetrical imbalance in the sender-receiver relationship: the sender can transmit information and get cooperation under way, but has no guarantee that the receiver receives the transmission, while the receiver has no guarantee that the sender's declared identity is the real one [31].

In this sense, this form of communication may be defined as a process by which a group of social actors in a given situation negotiates the meaning of the various situations which arise between them [32].

4.3.2 Understanding situations: the first step towards a shared context meaning

Stasser's definition of computer mediated communication may seem us straightforward enough, but it has two important implications which have had a decisive effect on studies in this area. If computer mediated communication is a process of negotiation:

- the only way to understand it is by analyzing the subjects involved in it, and in the environment in which they operate, meaning that the social context in which computer mediated communication occurs plays a crucial role;
- new processes and activities will develop which challenge and change the initial relationship between subject and context.

This idea is also shared by many educational psychologists and it is expressed with the need of learner-centered learning environments. No single teaching method is best for all students [33, 34]. So teachers have to focus their attention to the knowledge, skills, and attitudes that learners bring into the classroom. This incorporates the preconceptions regarding subject matter already discussed, but it also includes a broader understanding of the learner [6]. Another key point is the attention to the individual progress of each student in order to devise tasks that are appropriate. Learner-centered teachers present students with difficulties challenging enough to maintain engagement, but not so difficult as to lead to discouragement. They must therefore have an understanding of their students' knowledge, skill levels, and interests [35].

As noted by Schroeder & Grabowsky [36], “in a highly learner controlled hypermedia environment, learners navigate through the information creating a personal interpretative representation of that information. Each individual can take a different path, encountering different amounts and types of information” (p. 313). If this is true, then students, when using web-based learning tools, will be able to reach educational goals more efficiently when instructional procedures are adapted to individual differences [37]. And this calls for both the knowledge of the different aptitudes of the users and the knowledge of the social context where the learning activity will happen. But, how can we analyze the social context of a Web-based learning tool?

In Chapter 2 we defined as our starting point is the Situated Action theory developed within the field of socio-cognitive research known as "cognition in practice". Though based on traditional cognitivist analyses of information processing and symbolization, Situated Action theory introduces a change of perspective in that it sees action not as the execution of a ready-conceived plan, but as adaptation to context [38]. As noted by Federico [3] “if hypermedia can be considered a knowledge base, then students’ navigational paths through this semantic network-like structure can show what nodes they linked, thereby uncovering what concepts are associated. This, in turn, can reveal semantic structures constructed by individuals as they attempt to learn the entire knowledge base, or acquire the course content” (p. 669). This means, as Suchman notes, that "instead of separating action from the circumstances in which it occurs as the execution of a carefully thought out plan ... [Situated Action theory] tries to study how people use circumstances to develop an intelligent course of action" (p.167).

Thus, Situated Action theory implies a radical redefinition of the meaning of communication. Context may be co-constructed by social actors, but they use communication to exchange meanings, not pieces of information. More precisely, the content of communication is interpretations of the situations which actors are involved in. In this sense, the most effective way of clarifying the meaning of messages is to relate them to a shared context of meaning. However, a number of students do not have sufficient metacognitive experience in monitoring and controlling their learning in network-based instructional settings. As underlined by Federico [3] "these individuals have limited situation assessment skills and decision making schemata that allow them to exercise efficiently and effectively learner control in these hypermedia settings. Consequently, what is needed is a practical means of tracking students' navigation paths through this content" (p. 669).

4.3.3 Creating community: the second step towards a shared context meaning

Shared hypermedia (SHY) can be a possible answer to this problem. As we have seen before, using a SHY teachers can monitors learners' routes through the hypermedia content and guide student's interactions. However, to be effective the use of SHY-based learning systems calls for conceptual mechanisms with which groups can be built and vehicles through which groups can express themselves [39]. But, how do users include themselves in the virtual groups created by SHYs? Usually learners view themselves in the shared web experience in terms of how they manage the other users with which they are associated, particularly by relating to such cultural objects such as "consistency", "integration" or "balance".

Studies of Positioning theory, also discussed in detail in Chapter 2, have served to reinforce this view. As recently formulated by Rom Harré [40, 41] this theory replaces the traditional concept of role with the concept of positioning. The main difference between the two is that a role is a stable and clearly defined category, while positioning is a dynamic process generated by communication.

Positioning theory adds new ideas about the relationship between mental and communicative processes to its analysis of context. As we have seen in Chapter 2, there is indeed a link between mental and communicative processes, which leads to the formation of specific mental structures called brainframes. However, Positioning theory is mainly concerned with the relationship between communication, social context, self, and identity.

In this context the critical question is: how can you communicate and activate the positioning process in a shared hypermedia without staking your own identity on the outcome? As we have seen, communication always needs a framework of rules and meanings, and this is especially true of computer mediated communication in which many features of face-to-face conversation are 'rarefied'. As discussed in Chapter 3, one solution [42] is to represent yourself by "coding cultural expectations at a symbolic level" (p. 102). In constructing a false identity, the subject has to make wider use of social stereotypes than would be the case in normal conversation if he wishes his identity to be recognized and accepted. This means that computer mediated communication, may force subjects to resort to massive use of stereotypical attitudes and behaviors, otherwise they are unlikely to achieve any shared understanding of actions and situations [28].

For this reason the use of SHY can have drawbacks for learning, particularly in the early grades. For instance, in non moderated SHY, societal stereotypes or classroom reputations could determine who takes the lead, and whose ideas are respected or dismissed. Differences in temperament can produce consistent leaders and followers. Group products can advance each members' understanding of a problem, or they can mask a lack of understanding by some.

Many of the developers of SHY are aware of this and are conscious of the need to "create community" in the context of their efforts [39]. Even if many of the traditional means for creating community are not available, a great effort is given to the creation of virtual auditoriums or meeting rooms. As we have seen in Chapter 3 the work of maintaining virtual communities is similar to the one of an innkeeper [43]: facilitating interaction and keeping order among patrons. In fact, if a shared hypermedia has to serve as community for its users, it has to embody, or replace with adequate substitutes, some functions of community life that parallel those currently provided by "traditional" communities. In the socially constructed space of Cyberspace, where interaction produces culture, information is the only real medium of exchange [44] an individual has with which to build a presence. Information exchange becomes the carrier for expressing self-concept and eliciting emotional support. Affiliations which form around general and special interests are limited only by the ability of individuals to process all the interactions that flow through the network to the desktop. The range and relative newness of affiliations means that they have little or no time bound histories. As noted by Cutler [44], "commitment to relationships and community does not come out of previous relationships but out of the temporal mutuality of interests" (p. 21).

This concept is also very important for defining the possible role of teachers in SHY. In the past education has tended to emphasize memorization and mastery of text. However, the research on the development of expertise [16] indicates that more than a set of general problem-solving skills or memory for an array of facts is necessary to achieve deep understanding. Expertise requires well-organized knowledge of concepts, principles, and procedures of inquiry. To reach this goal teachers have to engage students in a variety of different activities for constructing a knowledge base in the subject domain. Such approaches involve both a set of facts and clearly defined principles. The teacher's goal is to develop students' understanding of a given topic, as well as to help them develop into independent and thoughtful problem solvers. One way to do this is by showing students that they already have relevant knowledge. As students work through different problems that a teacher presents, they develop their understanding into principles that govern the topic.

Finally, through discourse made possible by a shared hypermedia, individuals find or form communities that share interests and norms. As we have already seen the norms and the sense of community established in the community have also strong effects on students' achievement. Students might help one another solve problems by building on each other's knowledge, asking questions to clarify explanations, and suggesting avenues that would move the group toward its goal [13]. Both cooperation in problem solving [14] and argumentation [15] among students in such an intellectual community enhance cognitive development.

4.4 Conclusions

Internet-based information and communication are changing how instruction and assessment are being conducted in innovative schools, colleges and universities throughout the world [3]. In fact, many academic institutions and private corporation are now recognizing the need for learning at distance. However, understanding how to use the WWW to support training and learning activities presents a substantial challenge for the designers and evaluators of this emerging technology. Particularly they have to understand how communication and interaction, two key features of the learning process, are modified by the use of computers. This paper tried to analyze these changes and defined some guidelines for the development of web-based learning tools.

These tools can be considered a particular form of hypermedia: computer-stored information, which is related and retrieved via links. In hypermedia, navigational paths through the nodes are ultimately determined by the users, who freely control the movement among nodes, according to intrinsic interests and present goals. In fact, in these educational environments [11] "the learner is viewed as part of an instructional ecosystem, simultaneously shaping and being shaped by the instruction encountered" (p. 24).

However, for students to thrive in hypermedia they must possess an adequate metacognitive experience providing sufficient domain knowledge, experience and ability. When this happens, students can intrinsically model the learning process, by making their own knowledge assemblies or association in a coordinated environment [3, 11].

The evolution of hypermedia are Shared Hypermedia (SHY): new Internet tools attaching computer mediated communication to Web browsing. In SHY different users, who are simultaneously browsing the same Web site, can communicate with each other and share files or web addresses.

By assembling people with similar interests and surfing habits, this new Internet platform transforms Web browsing into a social activity. The most advanced SHY also have a web tour option allowing a leader to both guide the browsing of a small group of users and interact with them in real time. However, to be effective the use of SHY-based learning systems calls for conceptual mechanisms with which groups can be constructed and vehicles through which groups can express themselves.

As we have seen, each has important methodological and technical implications for the study and development of web-based learning tools. On the one hand. 'teacher' and 'student', both of which are abstract, monofunctional entities, have been replaced by interlocutors endowed with thoughts, emotions, affects, and a psychosocial identity which expresses their positioning within, groups, organizations and institutions. On the other hand, it has shown us that we must now look carefully not only at the social impact but also, and more important, at the implications for users' identity and cognition of what actually happens in networked interaction in shared communicative environments. Students and teachers must be enabled and encouraged to establish a community of learners among themselves. These communities can build a sense of comfort with questioning rather than knowing the answer and can develop a model of creating new ideas that build on the contributions of individual members. They can engender a sense of the excitement of learning that is then transferred to the classroom, conferring a sense of ownership of new ideas as they apply to theory and practice. Thus, through discourse made possible by a shared hypermedia, individuals find or form groups that share interests.

We believe that the presented model can prove a useful framework and might stimulate development of future studies taking into proper account the strict link between cognition, knowledge and interaction.

4.5 Acknowledgment

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