

Supporting Learning Communities in Education

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‘Any true understanding is dialogic in nature.’
- Mikhail Bakhtin

‘All higher [mental] functions originate as actual relations between human
individuals’
- Lev Vygotsky

Abstract: Different conceptions of learning are related with different ideas of knowledge. Conceptions of learning are guiding our way to design learning practices. This article starts by defining different ideas behind learning and introduces the role of communication and community in effective learning process. The article proceeds by introducing different ways to use learning technology to support learning. Furthermore the article deals with the model of progressive inquiry which has been used as a method in instructional design. The model of progressive inquiry has also been embedded into the FLE2 GroupWare application, which is introduced in the last part of the article.

1. Knowledge, Constructivism and Communication

In number of theories of teaching and learning a common misconception has been that knowledge is only a collection of information, such as articles or goods, which can be stored and transferred in different ways. In this kind of thinking a human mind has been seen as a one place to store this knowledge. The theory, based on behaviorism, has lead to teacher and media centered learning practices where the teacher is seen as the transmitter of knowledge to students. The students' role has been to store the knowledge given from the teacher. The decision to teach students in groups has been based on economical factors.

In psychology of education the theory of social constructivism asserts that knowledge can not be transmitted from teacher to students. To transfer knowledge from one mind to another is impossible because human mind is never 'free' from prior knowledge. For this reason new knowledge needs to be constructed based on prior knowledge. (for instance: Rauste-von Wright, 1997) Knowledge can be obtained only if the learners are actively constructing their own understanding of the knowledge under consideration of the community. Construction of knowledge can also be seen as a participation in shared learning activities (Sfard 1998).

The theory of social constuctivism argues that every human constructs unique understanding of the world by experiencing, evaluating and interpreting the world and by merging these interpretations with their earlier interpretations of the world. Constructivist learning is active and learner-centered rather than passive or teacher-directed. (for instance: Rauste-von Wright, 1997)

	Constructivist Approach	Behavioral Approach
Knowledge	Knowledge is active, in process and situated in worlds	Knowledge is inert and stable
Obtaining Knowledge	Individuals construct knowledge with other individuals	Individuals are passive recipients of knowledge
Learning	Meaningful learning is build on the learners prior knowledge	Learning occurs with mechanical, programmatic and repeated activities
Teacher's Role	Teacher's role is coach, supervisor, mediator, co-learner	Teacher's role is authoritative, directive

Table I: Constructivist and behavioral approach to knowledge and learning

Constructivist approach implies that students make external artifacts that they can reflect on and share with others. By creating artifacts students are likely to create new ideas. Students may also have an effect on the learning environment they are working in. They may manipulate and develop the environment to fit better on their own purposes. (Bers 1998)

Learning is always communicative and therefore a social process. Learners are communicating by making their own interpretations of the information received. The 'communication' can also be an individual and internal mental process, especially when using external knowledge artifacts. The learner is communicating internally with the author of the information, but also with number of other authors of different information by assimilating the information to her or his prior knowledge.

Human communication is in form of natural language (including written, spoken, non-verbal and visual language) and messages always need to be interpreted by the receiver. In the book *L'empire rhétorique*¹ (with Olbrechts-Tyteca in 1977) Chaïm Perelman (1912-1984) considers the problem of natural language. He maintains that for centuries mathematical language has been considered as a model for natural language, where messages are clear and that multiple interpretations are the result of their authors' negligence or the interpreters' bad faith. This can be attributed to the rationalistic thinkers in the history of philosophy. Today, however, it is widely recognized that in natural language ambiguity is unavoidable, as the natural language is inevitably equivocal and

¹ Published in English in 1982, by tittle *The Real of Rhetoric*.

incomplete. The terms that are available are often open to more than one single interpretation. This means that since words alone cannot guarantee infallible comprehension of a message we must look outside the world of the message - we need to communicate. (Perelman 1982)

2. Learning Technology as a Tool to Support Learning Communities

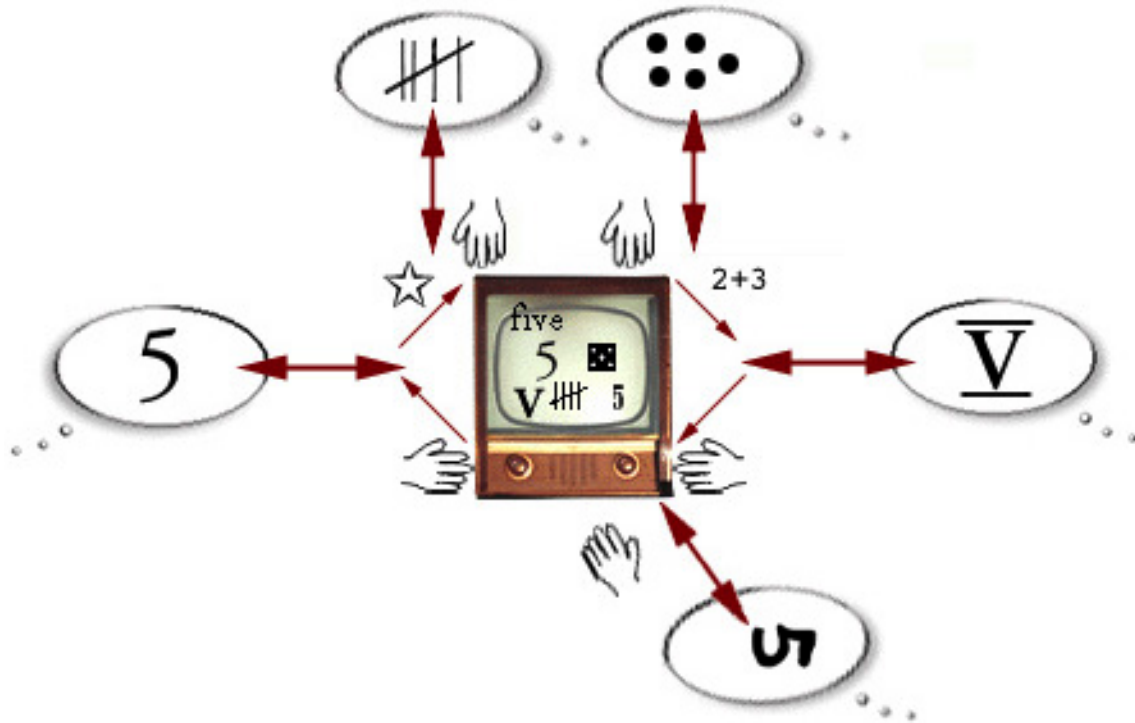
A number of solutions of educational technology are based on the theory of behaviorism and designed to strength the 'from teacher to students' module. In some cases the technical solutions have even tried replaced the human teacher. The approach has lead to solutions where knowledge has been tried to transfer straight 'from technology or media to students'. The assumption has been that students learn best 'from' rather than 'with' technology and other humans. The learning has been seen only as an individual process of assimilating knowledge (Reeves 1997).



Picture I: Example of the learning 'from technology/media' -approach

Typical examples of the 'from' -approach using technology are the use of books, radio, TV, Computer Based Training on CD-ROM, video-on-demand, static WWW-pages and other broadcasting type of delivery. All these media/technologies are important in their role to support learning process but alone they do not lead to deeper understanding and knowledge.

In the 'with' -approach the technical applications are students' tools for selecting, collecting and sharing information with other learners. The technology acts as a tool for collaborative creative thinking and learning, not only as a source for data gathering and processing. The process involves the organizing of existing knowledge, interpretation and analysis as well as a collaborative construction of new understanding and knowledge.



Picture II: Example of the learning 'with technology/media' -approach

Examples of the learning 'with' technology are GroupWare applications, teleconferencing, interactive WWW-pages, simulations and other tools for collaborative investigation and knowledge building.

Originally the World Wide Web was designed to be real 'read and write media', a GroupWare application, for researchers to share they research results and to work together. The World Wide Web was begun in Switzerland by a group of high-energy physicists who wanted to be able to communicate by computer regardless of user's platform. The vision was to develop an application for communication, which is free and open to everyone. For this reason the group developed the HTML language, which is free and open. In a document dates around 1991 and 1992, one of the main developers of the World Wide Web, Tim Berners-Lee, describes the vision of the WWW, as following:

'W3 (WWW) was originally developed to allow information sharing within internationally dispersed teams, and the dissemination of information by support groups. Originally aimed at the High Energy Physics community, it has spread to other areas and attracted much interest in user support, resource discovery and collaborative work areas.' (Berners-Lee T. 1991/92: World Wide Web Summary: <http://www.w3.org/Summary.html>)

The founding fathers of WWW were all members of research community who were inspired by academic traditions of sharing discoveries and working together. Such collaboration has produced the Internet itself, Linux operating system, Apache web-server and number of other useful technical solutions. Today the Internet is available in all fields of research and widely in education sector, but hardly used for collaborative knowledge building. In the future, a challenge is to develop

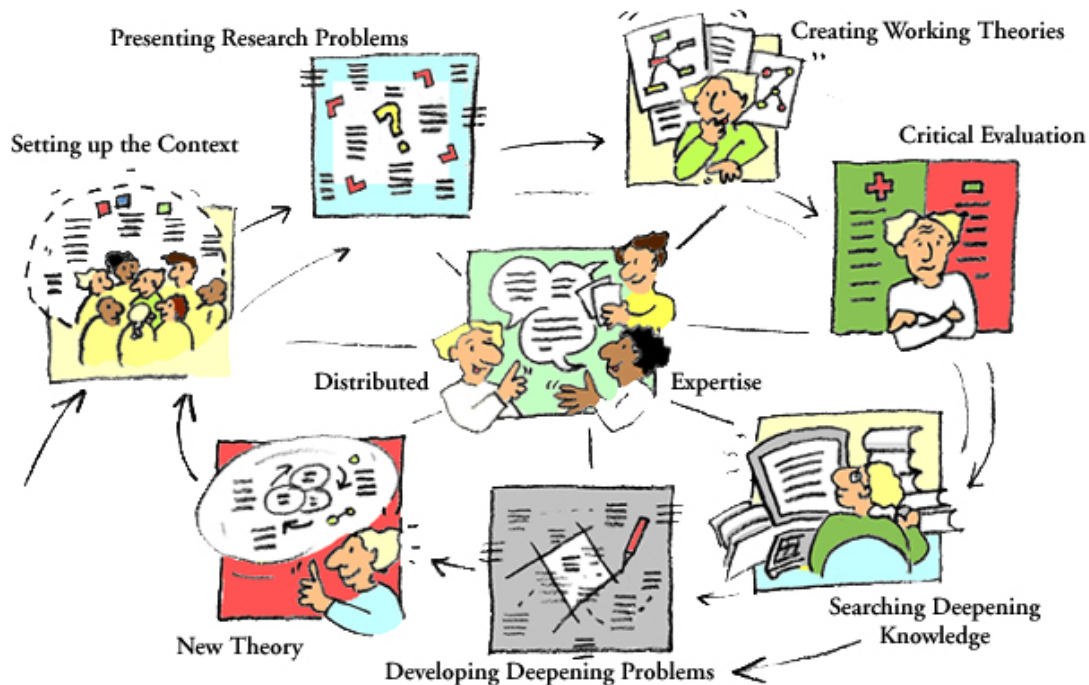
models and practices of working and discovering in learning and to design more user-friendly interfaces for different users.

3. The Model of Progressive Inquiry

The model of progressive inquiry entails that knowledge is not simply assimilated but constructed through solving problems in communities. Instead of direct assimilation the students should treat information as something that needs to be explained (Bereiter & Scardamalia, 1993). By simulating practices of scientific research communities or software/product development teams, the students can engage in question- and explanation-driven inquiry. In intensive collaboration the resources of the whole learning community may be used to advance the process. To guide the students' inquiry process the collaboration, such as dialogue, can be carried out by using knowledge objects such as hypotheses, theories, explanations or interpretations (Scardamalia & Bereiter, 1996).

INQUIRY LEARNING PROCESS AND DISTRIBUTED EXPERTISE

[Hakkarainen, Muukkonen 1998]



Picture III: Elements of progressive inquiry (Muukkonen et al 1999)

Setting up the context

A starting point of the process of inquiry is creating a context for a study project. The purpose of context creating is to help the students to understand why the issues in question are worthwhile to investigate and to cognitively commit to solve these problems. Teacher or supervisor has a very important role in creating the context jointly with the students; essentially, he or she needs to guide the learning community to jointly plan and set up goals for a study project.

Presenting research problems

An essential aspect of progressive inquiry is to set up questions or problems that guide the process of inquiry. Scientific inquiry can be seen as a problem-solving process: initial question defines the domains where the inquiry is directed and more refined questions guide the process. Conceptual problems that arise from students' own attempts to understand and explain the problems being investigated have a special cognitive value in the process of inquiry, helping a student to guide and regulate their knowledge-building efforts.

Creating working theories

Another important aspect of inquiry, and a critical condition of developing conceptual understanding, is generation of one's own working theories — one's conjectures, hypotheses, theories or interpretations — for the phenomena being investigated (Carey & Smith, 1995; Perkins, Crismond, Simmons, & Under, 1995; Scardamalia & Bereiter, 1993). Construction of working theories guides students to systematically use their background knowledge and make abductive inferences to explain new phenomena and extend understanding.

Critical evaluation

Through evaluating whether and how well the working theories explain the chosen problems, the learning community seeks to assess strengths and the weaknesses of different explanations and identify contradictory explanations, gaps of knowledge, and limitations of the power of intuitive explanation. The evaluation helps the community to direct and regulate joint cognitive efforts toward searching new information that will help advance shared understanding.

Searching deepening knowledge

The questions generated and working theories constructed provide heuristical guidance in the search for new scientific information by suggesting possible directions in which potential answers and more specific information can be sought. By examining one's prior problem statements or working theories with the help of new information, the student may become aware of his or her inadequate presuppositions or background assumptions. Further, large bodies of information cannot be managed without questions that guide and constrain the knowledge seeking process and help to conceptually structure obtained information.

Developing deepening problems

In genuine problem-solving situations one has to start to generate questions and tentative theories before all necessary information is available. As a consequence, the process of inquiry often has to start with very general, unspecified and 'fuzzy' questions and tentative working theories (Sintonen, 1991). In spite of gaps, weaknesses, or unclarities, these kinds of general questions and working theories function as tools of inquiry and provide a basis for progressive inquiry. A critical condition for progress is that a student focuses on improving his or her theory by generating more specific questions and searching for new information.

New theory

The dynamic nature of inquiry is based on the generation of intuitive explanations and acquiring of new scientific information, which in turn make new research questions and more elaborate working theories accessible to the students, theories that could not have been anticipated in the beginning of the inquiry.

Distributed expertise

All aspects of inquiry — such setting up research questions, searching for new scientific information, constructing of one's own working theories or assessing the explanations generated — can be shared with fellow inquirers. Cognitive research indicates that advancement of inquiry can be substantially elicited by relying on socially distributed cognitive resources, and collaborative efforts to advance shared understanding. There is, further, a growing body of evidence that cognitive diversity and variation in the fields of expertise promote knowledge advancement and cognitive growth. Through social interaction, contradictions, inconsistencies and limitations of a student's explanations may become salient to him or her; one is forced to perceive conceptualizations from different points of view. Collaborative inquiry facilitates deepening conceptual understanding by pushing a student to commit to some idea or belief, as well as to organize and reorganize his or her knowledge (Hatano & Inagaki, 1992).

4. Case: FLE2 - GroupWare for Progressive Inquiry

The FLE2 GroupWare consists of several modules that are designed to facilitate collaborative knowledge building in university and vocational education. The model of progressive inquiry has been guiding the software specification work and the model has been tried to embed into the FLE2 GroupWare application, as well. The modules include: WebTop (virtual desktop in the web), Knowledge Building module, Jam Session module, Library module and Administration module for tutors and system administrator.

Virtual WebTop

The FLE2 GroupWare provides each user with a personal open 'desktop' in the web (WebTop). The WebTop is used to store digital materials and to share them with other users. Into the personal WebTop the users may add new folders, files and links. The user may also edit, rename and remove the folders, files and links from his or her own WebTop. Inside the folders the users may create new sub-folders and add new files and links inside them.

In the background of the WebTop is a metaphor of an open office in which you could go to work in any desk, observe what other people are working on, and leave your own notes. Accordingly, the WebTop allows a student to visit in WebTops of other users in the same course. Through examining fellow students' WebTops, students are able to share the process of inquiry and to get acquainted to their fellow students' interests, and to observe their studies across different courses. Coordination of collaborative inquiry efforts is supported by a tool that allows a students or tutor to leave 'stickies' to other participants WebTop.

The Knowledge Building Module

The Knowledge Building (KB) Module provides a shared space for working together for solving problems and developing ideas and thoughts generated by the users. All KB notes within a course are posted to the shared space, visible as lists of messages. Each KB discussion is accessible only to the users enlisted as participants of that specific course.

Participation in progressive inquiry is facilitated by asking a user who is preparing a discussion message to categorize the message by choosing a 'category of inquiry scaffold' (e.g., Problem, Working theory, Deepening Knowledge, Summary) corresponding to the progressive inquiry model (based on the practices of Scardamalia & Bereiter, 1993). These scaffolds are designed to encourage students to engage in expert-like processing of knowledge; they help to move beyond simple question-answer discussion and elicit practices of progressive inquiry.

The Jam Session module

In contrast to the KB Module, the Jam Session encourages free flow of ideas and experimentation with different ways of representing knowledge. The environment provides tools for storing different versions of the object being developed, whether it be a design, a project report, software or some other type of document. The users may take a version of the object and elaborate it further, and upload it for the other users to be developed further. The Jam Session module assists in making thinking visible (Brown, Collins, & Duquid, 1989; Scardamalia & Bereiter, 1989) by providing a graphic representation of development of a knowledge object.

The Library

The Library allows the users to share the documents produced in various formats: text, graphics, audio, video, multimedia, or WWW links. The Library contains course materials chosen by the tutor as well as materials produced by the users. Materials from earlier courses may also be stored in the Library and made accessible to later users. The environment is intended to provide tools for helping teachers and students to create digitized study materials, to collect interesting link addresses to folders, and also gain access to other libraries linked to the Internet.

The Administration

The Administration module contains tools to administer users, groups, courses and course materials. The administration tools are usable through web-browser, too.

5. Conclusion

New technology may provide technical infrastructure and platforms, which are supporting learning in communities. The actual pedagogical changes are, however, dependent on the users' commitment to explore new pedagogical practices fostered by the technology. Without teacher's support and facilitation and the commitment of the group to work and learn together it is likely that

network-mediated interaction between the users do not advance and lead to in-depth conceptual understanding.

The key words of the current theories of learning and education are: problem-based, learner-centered, inquiry learning, dialogue, collaboration, knowledge building etc. According to Plato, Socrates (b. c. 470 BC - d. 399) already tried to get people to think for themselves rather than teaching a set of facts. Socrates was a master of dialogue. The Socratic pedagogical dialogues were based on students' questions, hypothesis, examples and definitions. Socrates himself was guiding the dialogue by summarizing the main points and searching dialectical agreements. Socrates' main 'teaching' was that all values can be reduced to a single virtue, knowledge. And knowledge can be obtained in dialogue only.

Maybe the new technology will offer us a modern 'agora'² and 'symposium'³ to obtain knowledge in different learning communities. Hopefully the modern agora and the symposium will this time be open and free for everybody, not just for free men.

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² In ancient Greek cities, an open space that served as a meeting ground for the citizens. Free men went to Agora to talk and idle.

³ Symposium is the Greek term for a party. In ancient Greek the enjoyment of Symposium was heightened by agreeable conversation, by philosophical discussion, by the introduction of music and dancing, and by games and amusements of various kinds.

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