

# OUR CONNECTION TO KNOWLEDGE AND THE TOOLS OF PEDAGOGICAL INTELLIGENCE



**JEAN-PAUL PINTE**  
Professeur, Teacher and  
researcher in competitive  
intelligence  
Université catholique de  
Lille-France

THE SEARCH FOR INFORMATION IS STILL A GREAT ADVENTURE ON WHICH EACH OF US EMBARKS IN OUR DISCOVERY OF THE UNKNOWN. THE VOYAGE MUST BE APPEALING TO US!

*Bring me the information that I need, when I need it, and if possible without my having to ask for it...*

It is human nature to produce knowledge, drink it in and desire to share it. The hunt for valid information creates new styles of reasoning and new forms of knowledge. It creates a desire to share and grow the collective intelligence of human groups.

Moreover, it seems that intellectual technologies that originated in cyberspace, amplify, externalize and alter a number of human cognitive functions like memory, imagination, perception and reasoning.

For the first time in the history of humanity, most of the competencies that a person acquires at the start of their professional journey will be obsolete by the end of their career. Additionally, what we must learn can no longer be planned in advance. We must now build new models for the knowledge that is emerging. Knowledge that is continuous, that flows in non-linear fashion and that is reorganized based on objectives or contexts and in the shared spirit of collectivity.

## FROM TECHNOLOGICAL TRANSITION TO TECHNOLOGICAL DIZZINESS

It was only a few years ago that a person in search of information had to go to a documentation centre and manipulate professional techniques designed by experts in information and documentation in order to find a resource, article or book. However, in the 1980's, a great hope for computerized documentary research was born with the advent of computers.

We were now able to formulate our research more openly by diversifying access to resources; this significantly modified the relationship between the user and the document. Since 1993, the network of networks gave birth to the concept of cyberspace, a brand new emblem of encyclopaedic universality so described by Morizio (2002). Its use in documentation resource centres and in homes quickly highlighted differences between access to information and construction of knowledge. Actual numbers and usage can make us very dizzy. Today, the firm ET Forecasts projected that the number of Net surfers would be over the billion mark by 2005; International Data Corp estimated that more than 30 billion emails were being sent each day by the end of 2005. In addition, Online Computer Library Center Inc. (OCLC) calculates that there are about 9.04 million individual websites; the Cyveillance corporation estimates that the visible Web<sup>1</sup> contains more than 8 billion pages and, finally, according to the Brightplanet company, the invisible Web contained approximately 550 billion documents at the time this article was written...

It is readily understood that with this kind of informational layering, any player within the education system can feel somewhat inadequate about initiating Net searches. Also, in the new millennium, the educational world is raising a number of questions about the relationship between documentary research, the use of new technologies and learning. Various types of knowledge structures in digital documentation are also of interest for research in cognitive psychology. The Internet and multimedia<sup>2</sup> must be seen today by researchers, decision makers and education professionals, teachers and students alike as tools for carrying out searches, growing knowledge on specific problematics or a given topic, sharing knowledge and bringing their practices up to date.

We must not forget however, that search for information is not uniquely a mechanistic procedure but also a "human" affair that produces knowledge, brings it into play, stores and transmits it, lays claim to it and then shares it in order to be and to act.

<sup>1</sup> The "visible Web" is the totality of Web pages that can be indexed by search engines versus the "invisible Web" that search engines cannot reach.

<sup>2</sup> Multimedia comprises communication tools such as CD Rom, the press, radio, television, etc.





## THE LINK TO KNOWLEDGE

No one can escape the obvious. Since the end of the last century, reports have shown the lightning fast appearance and renewal of knowledge and expertise. A new culture is emerging as regards the handling of knowledge in constant flux and the constant creation of new knowledge. Educators confront a difficult modernity. Whether we want to or not, we are living the emergence of a “transgenerational break in linkage”. Thus, things that were established and transmitted in an almost natural manner through the imprinting of one person upon another, have difficulty even being transmitted today.

We need to prepare for radical changes and master new information management processes. In this context, nobody can escape the amplification of their own relationship to knowledge which is: To give meaning and therefore value to the interactions between oneself and the processes or products of knowledge (Charlot, 1999). Whatever the educational level where one works (primary education, secondary, collegial or university), the relationship to knowledge is a determining one; given that knowledge is the common foundation of all schools.

## PEDAGOGICAL INTELLIGENCE: AN ESSENTIAL ACTIVITY FOR ALL EDUCATORS

The importance of clarifying our relationship to knowledge and carrying out informational searches is impossible to circumvent. Fortunately, there are tools today for educators that are able to overcome these new challenges. They are the tools of pedagogical intelligence.

For researchers, decision makers and education professionals such as educational advisors, these pedagogical intelligence tools allow us to meet today's expectations of on-line knowledge, the filtering of information on the network thanks to specific tools, currently under development; the search for relevant information that is “just in time” and the progressive automation of this intelligence thanks to engines equipped with this type of notification. It will also mean avoiding single-minded thinking given the plurality of sources, for instance the practice of systematically “googling” that is done in the search for information, without any real cognitive management.

The principal role of the teacher can no longer be limited to that of disseminator of knowledge. His competency must support the “challenge to learn and think” and encourage a deepening of the information culture of the student. The tools of pedagogical intelligence will help the teacher focus on coaching and the management of learning, on motivating students to search for knowledge, relational and symbolic mediation, personalized guidance on the road to learning, etc. He will be a “facilitator” for learning, a mediator between knowledge and the students through the creation of teaching environments, like a scenario writer in engineering and design exercising his creativity. The teacher must be a guide that coaches and helps the student avoid the aimless drifting and skidding that is a real possibility in this new technological universe.

For the students, pedagogical intelligence means acquiring competencies that are transferable and allow them to work autonomously when the time comes, to develop

the ability to choose their own paths, make their own discoveries, judiciously locate, and identify information sources.

## AN INITIAL VISION OF PEDAGOGICAL INTELLIGENCE

Pedagogical intelligence, not to be confused with technological intelligence, is a regular process of research, analysis, and selection of relevant information in the field of education whose purpose is to bring a competitive edge to the framework of research for all players in the field of education. Based on notification criteria used by intelligent agents or meta-search engines, the goal of pedagogical intelligence is to detect and facilitate documentary searches, identify expertise networks that sketch a map of a field or its conceptual calling card. One of the major stakes for educational players in the 21<sup>st</sup> century is mastery over information. This is the true mission of intelligence.

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Pedagogical intelligence is based on the concept of informational autonomy. This presupposes the prior definition of a base from where the research process will develop, in other words what type of information enters into the equation? At which decisional level can it be used? What is its operational field? How much time and attention does it require? What is its level of interest, its accessibility, its form and sources, etc.? (Diagram 1)

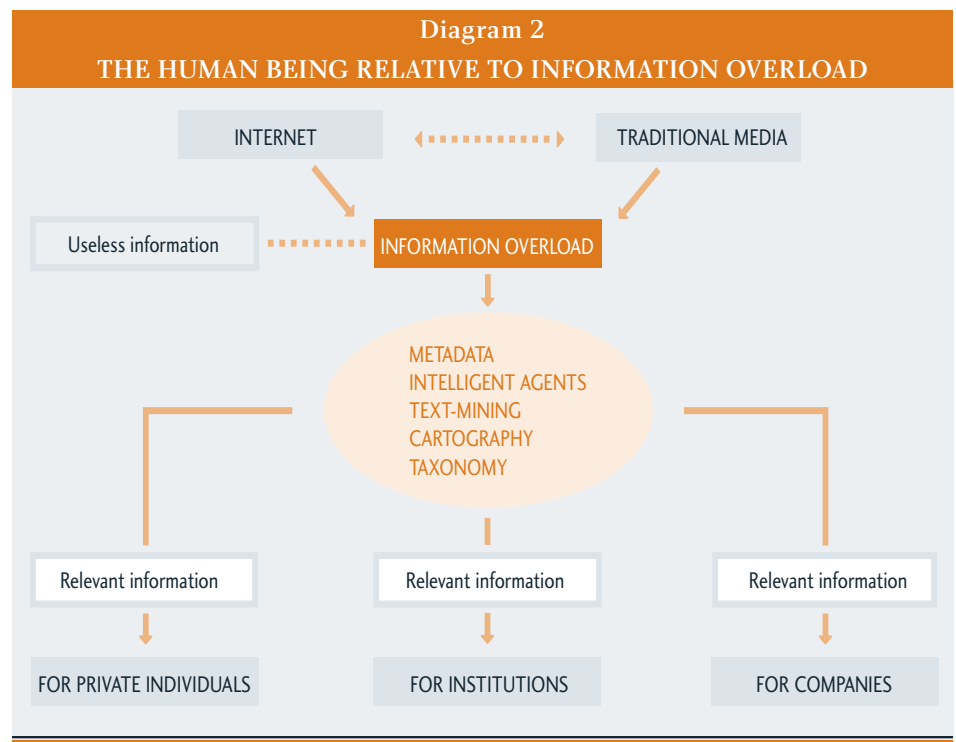
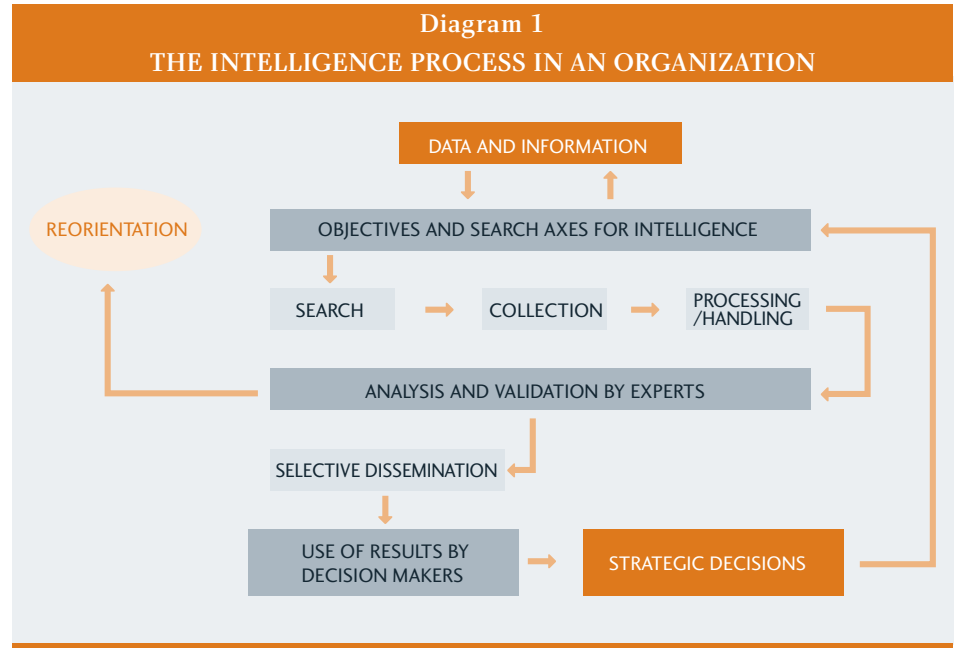


## TRACKING DOWN THE INFORMATION

To monitor intelligence in a field implies searching for information in this field, seeking it out and tracking it down wherever it may be. Overall, we can define information in terms of its structure and the types of media that contain it as well as the sources from where it is drawn.

The structuring of information can be illustrated by the colour coding used by Afnor<sup>3</sup> with white, gray and black. It reflects the work of several authors including Martre (1994) and Don (1995). White information is information on the Internet that is freely accessible and represents 80% of all existing information. It is not protected, its access is legal and it is accessible to the general public. Gray information is information on the Internet that is accessible only upon payment, represents approximately 15% of all available information, and has restricted access that requires specific authorization. Black information is information that is accessible only to certain select groups, represents 5% of available information, is strictly confidential and access without authorization is illegal. The essential principle of intelligence is founded mainly on the collection of information taken from the Internet that is freely accessible to all; information on the Internet that is accessible only upon payment represents a no-law zone that separates authorized sites versus prohi-bited ones in a rather fuzzy way.

As seen in diagram 2, the main information media and sources include all the various mass media, be it television, radio, the press, etc., and of course, the Internet. These information sources often complement each other through hypertext i.e. non-linear information



<sup>3</sup> Afnor: Association française de normalisation



resulting from semantic links within the documents that directs the searcher towards other resources on the World Wide Web. The Web contains more than four billion accessible indexed pages, as well as discussion forums. The computerized universe also conceals enormous amounts of data that are difficult to access or quite simply inaccessible, found in specialized data sources and inside personal micro-computers, unreachable by research engines and only by hackers.

Current information on a specific field can be located through various media, classified according to the following categories: Documentary, electronic, multi-media, relational and abstract. Within each medium, the information may be structured or not. Structured information such as forms, questionnaires, standards, data banks, patents, etc., is more rare and we will focus here on the multiplicity of information that is not structured. Current non-structured information in documentary format can include reviews, journals/newspapers, theses, instruction manuals, annual reports, booklets, etc. Electronic media can include blogs, Internet sites, discussion forums, dissemination lists, emails, etc. Multi-media can be sound recordings, films, documentaries, reports, photographs, etc. The category of media known as “relational” can include internal expertise, transfers between suppliers, and their customers, information resulting from symposiums, seminars, fairs, etc. Lastly, information in the category known as “abstract” includes material taken from conversations, rumours, etc.

The fact that non-structured information is much more abundant and diversified than structured information creates complex problems when it comes to intelligence monitoring: It is a question of indexing and using open information whose diversity is such that it is impossible to imagine a homogeneous handling process. Nor can we overlook the desire of Net surfers to access increasingly relevant information, while looking into the possibility of receiving the information directly on their personal computers without having to request it.

To accomplish this, all players in the field of education—from the researcher to the decision-maker, the learner to the teacher—must build a toolbox or pedagogical intelligence-monitoring package for the analysis of cybercultural context, the decoding of communication and the structuring of information. For this purpose, we must consider the use of automated intelligence tools and be familiar with a family of tools available to educators that successfully carry out requests for information<sup>4</sup>.

#### ► INTELLIGENCE TOOLS TO AVOID DROWNING IN A DELUGE OF DATA

“Knowledge is [...] as money is to bank tellers: Many transactions go through their hands but at end of day, are they personally any richer?” Perrenoud (1999). Vis-à-vis the imposing mass phenomenon of information, a human being quickly reaches a saturation level that is referred to as information overload. From this magma, he must select what is relevant and extract its essence.

There are various methods and means to catalogue information, like the use of metadata (data on data that describe the content and functionality of sources),

intelligent agents to automate and filter information, text-mining or the analysis of texts to extract what is essential, automated mapping that allows for a representation of information that is clear and synthetic and presented as “decks”, and finally taxonomy to classify and index information so as to go directly to what is essential. These methods play a role in knowledge management and make it possible to extract from a flood of data, information that is relevant to the Net surfer.

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The potential of a pedagogical intelligence tool rests mainly on its flexibility and its ability to convey information in a multimodal fashion. The development of informational autonomy helps prevent information overload through the use of specific tools that are invaluable in the manual or automated search for information considered “noiseless” or relevant.

#### ► REPERTORIES AND DIRECTORIES

Yahoo is the best known among the first research tools to have surfaced on the Web. David Filo and Jerry Yang, two students from Stamford University in the United States, created it in 1994.

The purpose of directories is to index Web sites and classify them in categories to facilitate their identification by the Net surfer. Starting from a topic, a series of sub-themes is recommended and finally ends in a list of sites that answer the question. There are three types of directories: General, selective, and thematic portals.

<sup>4</sup> In Québec, this type of intelligence is brilliantly carried out by Vitrine Apo, on line [<http://ntic.org/>].



- General directories are the best known and include sites open to the general public and professionals, in all fields.
- Selective directories try to include the most complete Web coverage possible on a specific topic. Older than general repertoires, these directories were created by experts in information, librarians or documentalists who choose only those sites best suited for answers to the various questions asked and which include only the sites in each category that possess the richest knowledge<sup>5</sup>.
- Directories with thematic portals are constructed along the same lines as general directories but are based on sets of themes: Their purpose is to list resources in a specific field. The same rationale that led several general directories to transform themselves into portals powered the evolution of many thematic directories towards thematic portals sometimes called “vertical portals”<sup>6</sup>.

## SEARCH ENGINES

The purpose of search engines that started surfacing on the Web in the 1990's is to index the greatest number of Web pages. These engines are accessible through requests using key words that search complete text pages. More precisely, three components make up search engines: A robot, an index, and a Web server.

The following paragraphs introduce various categories of tools to facilitate pedagogical intelligence. On-line filtering of information, more commonly called on-line information search today, is not new thanks to search engines and

documentary software. In fact it dates back over forty years and as Perriault states (2002, p. 64), the history of this procedure is interesting because, after having leaned towards “complete automatism”, the human factor is being reinserted into its makeup:

- The robot, also called crawler or spider, searches the Web in an automatic way, from link to link. Beginning with a certain number of predetermined addresses, the robot will follow all hypertext links it encounters and repatriate the contents of the pages in its core. It will also visit all pages named by site editors, within a referencing framework. This path from link to link throughout the Web requires four weeks on average, with the timeframe ranging from one to six weeks. When a complete “tour of the Web” is done, the robot sets out to update its core by including the new pages.
- The index contains all the words of all pages gathered by the robot. Generally, the complete text and the various Meta-guidelines<sup>7</sup> are indexed, but there can be variations according to search engines used.
- The Web server provides the research interface for the user. This enables him to launch a search of the engine's word index with more or less sophisticated possibilities.

## META-SEARCH ENGINES

It is with these tools that intelligence monitoring can be launched. No one search engine can guarantee complete coverage of the Internet network, therefore many must be investigated in order to succeed in gathering a panorama of what exists on the Net on a particular subject or to simply increase the odds of identifying relevant pages. It is the key role of meta-search engines to investigate several tools, successively or simultaneously depending on the situation. Some meta-search engines require that software be downloaded beforehand which then connects to the Internet during the search. It functions as desktop search software.

Among the many existing meta-search engines, the Open Directory includes more than 185 in its Metasearch Tools category. The most sophisticated ones record the request of the Net surfer, send it simultaneously to various engines and directories (chosen from an existing list), gather the answers together, eliminate duplication in results, classify the results (by relevance, topic, etc.) and sometimes offer the possibility of validating links.

## SEARCH AGENTS

Information search agents are known as desktop search software. They are intermediate software between the search engines and intelligent agents. Even if

<sup>5</sup> A description of the principal selective directories is provided under the heading bearing the same name on the BnF site [<http://signets.bnf.fr/>].

<sup>6</sup> English term “vortal” referring to a “vertical portal”.

<sup>7</sup> A Meta-guideline is information inserted by the Webmaster that is not displayed on screen and provides page indications (title, key words).



they do not share the same characteristics, they are for the most part much more advanced than simple search engines. Moreover, software publishers devote much effort in the creation of information search agents that reach the same performance level as intelligent agents.

## INTELLIGENT AGENTS

An intelligent agent must be able to display initiative and act without any intervention by the person searching for information. Within the context of the Web, it must be able to act even when the user is disconnected. Software publishers circumvent the problem of autonomy by programming their software so that it automatically connects to the Web at regular intervals, to carry out the tasks requested by the users. In this case, it is not really autonomy because the agent is not permanently active and only recreates in automatic fashion the request which was programmed. These agents have great diversity and they rarely fulfill the same tasks. However, we have identified five key functions:

- The selective search for information. The carrying out of searches on a precise topic. These searches are more or less thorough and complete.
- The implementation of intelligence monitoring based on themes. This function makes it possible to permanently follow the evolution of information on specific topics that have been pre-defined. The software has the responsibility of searching for the desired information in an automatic and periodic way.
- The management of collected information. To edit, file, delete, and update search results.
- The analysis of collected documents. This analysis will, for example, relate the documents to each other so as to elicit the relevant data from the mass. The creation of automatic summaries.
- Off-line browsing/data surfing. This function makes it possible to surf among the data found on the Internet without being connected to it.

Although the operating principle of agents is the same as that of meta-search engines on the Web, their broader potential and constant evolution means they are more powerful as search tools. Apart from the downloading of results which can be stored for future review, more and more intelligent agents tend to edit a search report by recalling the results and listing them in the format of an HTML page. Lastly, and of special concern, these intelligent agents are becoming more and more genuine automatic intelligence monitoring tools, with preset parameters that allow for disconnection when the work is done, the sending of a search report identifying new pages, the downloading of documents on the disc, the deletion of invalid links, etc. You can try ABONDANCE [www.agentland.com] which will show you how these intelligent agents function so as to maximize their use!

The following table presents an overview of specific tools that support the search for information.

### EXAMPLES OF SOFTWARE OR AUTOMATED INTELLIGENCE SITES (MONITORING PAGES, URL, ETC)

www.journaldunet.com  
 www.myriadworld.com/software/mru.htm  
 www.netmind.com  
 www.tracerlock.com  
 http://illumix.com/webspector.htm

### EXAMPLES OF TOOLS DEVOTED EXCLUSIVELY TO SEARCHES FOR DISSEMINATION LISTS AND DISCUSSION FORUMS

FRANCOPHOLISTES www.francopholistes.com  
 FOORUM www.foorum.fr  
 TILENET www.tile.net  
 TOPICA www.topica.com  
 GOOGLEGROUPS http://groups.google.fr

### EXAMPLES OF TOOLS DEVOTED EXCLUSIVELY TO SEARCHES FOR EMAIL ADDRESSES

ANNUMAIL www.annumail.com  
 BIGFOOT www.bigfoot.com  
 MESA http://mesa.rzn.uni-hannover.de  
 NEDSITE www.nedsite.nl/search/people.htm  
 YAHOO PEOPLE SEARCH http://people.yahoo.com

### EXAMPLES OF TOOLS USED EXCLUSIVELY TO FLAG NEW WEB PAGES

GOOGLE ALERT www.googlealert.com  
 MORNING PAPER www.boutell.com  
 MY UPDATE www.getupdated.com  
 URLYWAKNING www.urlywarning.com  
 SPYONIT www.spyonit.com  
 SEARCHENGINE www.searehenginewatch.com  
 FINDARTICLES www.findarticles.com  
 STRATEGIC FINDER www.strategicfinder.com  
 E-CATCH www.lamine.fr



#### EXAMPLES OF TOOLS USED EXCLUSIVELY TO SEARCHES FOR RELEVANT DOCUMENTATION

ABOUT	<a href="http://www.about.com">www.about.com</a>
ENFIN	<a href="http://www.enfin.com">www.enfin.com</a>
EO	<a href="http://www.eo.st">www.eo.st</a>
SOOPLE	<a href="http://www.soople.com">www.soople.com</a>
E9	<a href="http://www.e9.com">www.e9.com</a>
MAMMA	<a href="http://www.mamma.com">www.mamma.com</a>
INVISIBLEWEB	<a href="http://www.invisibleweb.com">www.invisibleweb.com</a>
PROFUSION	<a href="http://www.profusion.com">www.profusion.com</a>
QUERY SERVER	<a href="http://www.queryserver.com">www.queryserver.com</a>
VIVISIMO	<a href="http://www.vivisimo.com">www.vivisimo.com</a>
STRATEGIC FINDER SEARCH	<a href="http://www.strategicfinder.com">www.strategicfinder.com</a>

#### EXAMPLE OF PEDAGOGICAL INTELLIGENCE PLATFORMS

You could try out the soon-to-be-released version of COMMUNAUTICE, a sharing platform for knowledge and pedagogical intelligence for educators. This base, an on-line recommendation by the author of this article, will contain a selection of links and practical resources in education, retained by the author since 2002. Using the intelligence monitoring available on the platform, we can take our first steps in the world of the pedagogical intelligence.

COMMUNAUTICE [<http://communautice.icl-lille.fr/veille.php>].

#### SHARING INFORMATION IN A SOCIETY GEARED TO COLLECTIVE INTELLIGENCE

The question is not to download the human brain on hard disks, but to provide tools for searching, accessing, discovering, optimizing and, especially, sharing knowledge. The increasingly easy access to information that is more and more imposing in volume requires, now more than ever, the development of information ecology and a sharing of development and dissemination methods. A socioconstructivist community is shaping up. It is creating intelligent tools and approaches. We then see the appearance of evolutionary virtual environments called “virtual communities”, software environments whose development is founded on the participation of people in virtual communities thanks to multi-agent information systems and the power of new Internet-type networks. Thus is born “community technology” taken from “communication”, “community”, and “network”. It is a new field in communication sciences, a true mediation activity between various players in a field. Community technology is an applied science of analysis, intervention and the co-construction of knowledge in networks.

The Knowledge Management movement is promoting this trend towards the sharing of knowledge. When technologies are used in this spirit, their main goal is not to process the data, but to recommend virtual and digital devices that enable exchanges, searches, discoveries, collaborative work, and the dissemination of knowledge. In other words: Social goals above all!

Learning to live together as citizens of the world means sharing non-material data and un-localized knowledge with others from all corners of the globe, with the common goal of revitalizing communication between human beings. ◀▶

#### BIBLIOGRAPHICAL REFERENCES

CHARLOT, B., *Du rapport au savoir, éléments pour une théorie*, Éditions Economica, 1999.

DOU, H., *Veille technologique et compétitivité*, Éditions Dunod, 1995.

MARTRE, H., *Intelligence Économique et stratégie des entreprises*, 1994. Report available on line [<http://www.arphi.fr/Martre.htm>].

MORIZIO, C., *La recherche d'information*, Nathan Université, Éditions ADBS, 2002.

PERRIAULT, J., *Éducation et nouvelles technologies, théorie et pratiques*, Nathan Université, 2002.

PERRENOUD, E., *Dix nouvelles compétences pour enseigner. Invitation au voyage*, Paris, ESF, 1999.

Jean-Paul PINTÉ is a teacher and researcher in competitive monitoring and intelligence at the Université catholique de Lille. Holder of a Ph.D. from École Doctorale ICMS of Marne La Vallée, he occupies the role of instructor and part-time lecturer in strategic search for information in the field of education and the use of economic intelligence in various universities. International specialist in intelligence, he is also a member of the Comité scientifique de la *Revue internationale des technologies en pédagogie universitaire*.

[pintejp@aol.com](mailto:pintejp@aol.com) [<http://veillepedagogique.blog.lemonde.fr>]