

NETWORKING AND COLLECTIVE INTELLIGENCE FOR TEACHERS AND LEARNERS

Bernard Cornu

In: *Digital Technology, Communities and Education*, Brown A. & Davis N. (Eds.), pp. 40-45, World Yearbook of Education 2004, Routledge Falmer, London 2004.

A few years ago, researchers were studying and discussing the influence of computers on education, on teaching and learning. Computers were considered as wonderful new tools, able to enrich the resources available for teaching and to improve teaching and learning, through 'computer aided' devices, through appropriate software and through a more individualized way of learning. But the development of information technologies and of communication technologies, and their merging into ICT (Information and Communication Technologies) brought major and profound changes across the whole of society and in education.

Information is now digitalized, information technologies process digitalized information, and communication technologies transport digitalized information. One can digitalize texts, images, sound, videos, leading to multimedia digitalized information. One can communicate with others more and more easily; one can access any kind of information anywhere in the world in a few seconds. Digitalized information is more accessible, more interactive, easier to access, transport, store and process. One speaks about 'digitalized society', or 'information society'. Such a society, which is now appearing, has specific characteristics, and profound changes are occurring.

In this chapter, two main ideas linked with the emergence of the digitalized society will be addressed: networking, and collective intelligence. These two ideas are closely linked, and they will certainly influence education profoundly. We are at the very beginning of the development of such concepts, and in this chapter we will stay at a general level, raising issues and questions that will have to be more deeply addressed in the future.

A NETWORKED SOCIETY

The first major change in society is the development of networks and structuration in networks. Networks bring considerable change in education and in the role of the teacher. We are used to linear structures, and to pyramidal or hierarchical structures ('tree type'). This is the way our world is organized; our social systems are organized. For example, just look at the organization chart of a company, a government ministry or a university. It is typically a pyramidal structure. Look at the organization of a book; the table of contents is a linear structure, but allows a hierarchical use of the book, through the titles, subtitles, paragraphs, etc. This is just one of many possible examples.

A network is a set of interlinked points, or nodes. It is a complex structure, which has interesting properties. The networks of most interest are generally those made of people and information: linking people with people, people with information, information with information. In a network, there are generally many possible paths from one node to another; in contrast, in a pyramidal structure most of the time there is a unique path (we sometimes call it the hierarchical or official channel). In a network, there is often the possibility of creating new links. A network includes sub-networks. A network therefore creates new proximities, new hierarchies.

The example most often quoted is, of course, the Internet. It is a huge network, constantly making more complex and enriching. A web site is generally built according to a pyramidal, or 'tree', structure; some of them are in a more networked form, hypertext-links enriching the tree structure. But the set of all web sites has a much more complex structure. There are links between web sites, or even between pages or items in web sites. It is always possible to create new links. Circulating in such a network is not easy, and tools have been designed for that purpose: 'search engines', portals, etc. Behind web sites, there are individuals, groups of people and organizations. The network links not only web sites; it links people and information. The fact that now people and information can be connected in a networked form changes profoundly the relationship between people, and between people and information.

Let us look at some examples. New networks allow new kinds of communication between people. Of course, one can always communicate with the people one already knows. But accessing someone in a certain hierarchy, in an organization, now becomes possible without following the traditional official channel. It is easier now to find people's e-mail addresses than their telephone numbers; one can access people through their function, through their name and through other kinds of criteria. We really are in a new era of communication between people: networked communication.

Accessing information in a book has also changed. We are used to 'pyramidal' access, through the bibliography, through the title and the author's name, through the table of contents, the chapter titles, etc. Accessing information in a book was a kind of a circulation in a tree structure. But the new networks, such as the Internet, enable us to access information in books in new ways. We can go directly to a word, to an item of information, even without first knowing the author's name or the title of the book. We can move from one book to another one, we can link information from different books, we can circulate in books in a 'networked' form.

The organization chart of a company or an institution shows its hierarchical structure: heads, sub-heads, etc. A networked structure creates new links between the different components of an institution, creates new hierarchies and enables adaptation of the structure to solve different kinds of problems. In a world of networks, hierarchies in institutions cannot stay in the pyramidal form; they will have to evolve, adapt and take a networked form, more compatible with the network environment.

The case of education is particularly important. Since society is more and more networked, schools must prepare the pupils for this networked society. This implies an adaptation of the contents and, more importantly, the methods of education. Knowledge is now available and distributed in a networked form. The school is the place where pupils both gain knowledge and learn how to access and acquire knowledge. Therefore, schools must use the networks, be part of the networks and teach the networks. The traditional lesson, in which the knowledge circulates only from the teacher to the pupils, must change into a form where the knowledge is considered in a networked form and circulates in a networked way. The way in which resources, such as textbooks, libraries and distance materials, are used must take into account the networked form of knowledge. The school must be organized and designed in a more network-compatible form: pupils must be able to work in networks, teachers must work in networks and school administration must be more networked. Internal networks can be made available in schools (for instance, as 'intranets'), and schools must of course be linked to the Internet, so that networked work with other partners, such as other schools, other countries and other institutions, is made possible. Practitioners must consider all the consequences of

the networked form of the society and imagine the changes these may bring about in schools and in education.

One of the most pyramidal organizations, in a country like France, is the educational system itself. In a networked society, where education and schools should be at the centre of the networks, it is vital to imagine new forms of organizations for educational systems, better adapted to networks and facilitating the role of education in the networks.

COLLECTIVE INTELLIGENCE

A second major change in society is the emergence and the development of a more collective form of intelligence. We are traditionally used to intelligence as a personal and individual quality. School aims at developing the individual intelligence of the pupils. But groups, institutions and societies need a form of collective intelligence. Collective intelligence is not only the addition and juxtaposition of individual intelligences. There is a specific form to collective intelligence.

Let us look at a typical example: ants. One ant is a very simple animal, with very few competencies and a very limited intelligence. Its capacity for action and for communication is limited. But a group of ants, an ant-hill, is a very intelligent group: it is able to determine the shortest way from one point to an other, it is able to build bridges, it is able to overcome obstacles, it is able to carry very heavy loads. This kind of intelligence does not come from a hierarchical organization: there is no leader among the ants, there is no one knowing better than the others and explaining or showing the others, or coordinating the work (the role of the 'queen' is of a different nature). The ability of a group of ants comes from a collective behaviour through the 'stigmergy'. Ants produce a special smelling substance, a pheromone, which facilitates collective intelligence. For example, the time it takes for the smell of pheromone to disappear along a path and the amount of pheromone linked to the number of ants that have gone through this path, will enable the ants to determine the shortest path. Collective intelligence includes cooperative work and cooperative intelligence, but there is something more than just cooperation. Other groups of creatures, for example bees, also have a form of collective intelligence.

The collective intelligence of human beings is complex and takes many different forms, including collective knowledge, cooperation, collective work, collective thinking, group activities, enrichment and capitalization of knowledge and intelligence, and collective training. The current keywords associated with human collective intelligence are cooperation, transmission and hierarchy. But new information and communication technologies make available new networks, new ways of storing and accessing knowledge and resources and new ways of communicating with people and with groups. They create the possibility of a new form of collective intelligence, which may in turn substantially increase the collective capacity and competence of human beings. This collective intelligence is made of a network of individual intelligences. Individual intelligences are not only juxtaposed, but linked and inter-related in ways which make them complementary, which enrich them, in order to solve problems and address questions that need a collective form of intelligence.

Collective intelligence is emerging in many aspects of the social life. Citizenship in a networked society could become more and more collective, and based on a collective intelligence. Science and technology demand more and more collective intelligence. Industry, business and work in general, require more and more collective intelligence. The way people

work has evolved. We have moved from an individual to a cooperative mode: working together, sharing tasks and using teamwork. Collective intelligence adds a new dimension, since it brings into action new collective characteristics of human intelligence. Preparing students for collective intelligence and related competencies will be a necessity in the networked society.

Education is the privileged field for the development of collective intelligence, and the classroom is the first place where collective intelligence should be addressed, developed and improved. Learning has mostly been considered as an individual task. But we should now think in terms of collective learning: learning through collective tasks and activities, in order to develop not only individual but also collective knowledge and collective abilities. Once we have defined the aims of education in terms of collective knowledge and abilities, it is necessary to design and adapt activities in order to facilitate collective learning. New information and communication technologies make numerous activities available for the development of collective intelligence and learning.

Teaching has also to address these collective dimensions. New teaching content and methods must be elaborated and developed for this purpose. This means that the classroom, students and teachers, must be considered as a collective entity, with specific characteristics, in which specific activities can be set up in order to reinforce collectivity. This is again a new challenge for education in the networked society.

Teachers are, of course, the main agents of changes in education. Collective intelligence should first be developed for teachers. Traditionally, the teaching profession is a very lonely profession: teachers are alone in front of their pupils; teachers are alone for marking homework and papers; teachers are alone for preparing their lessons. A lonely profession, it could be said, can only lead to individual competencies and intelligence for the pupils. Establishing collective professional behaviour for teachers is necessary in the networked society. Teacher education has to take this into account, both in the content and in the methods of teacher education. Methods are important in teacher education: teachers tend not to act in the way they are told, but to reproduce, more or less consciously, the way they are taught and trained. Therefore, we do not only need courses about collective abilities and collective intelligence, but we need collective activities in teacher education. Developing a collective intelligence for teachers is a new task for teacher training institutions.

A NEW AGENDA

Such ideas need to be deepened and much work remains to be done. Some key points must be considered and acted upon. There is a need to define and study more precisely what collective information is, what collective knowledge is and what collective memory is. Collective knowledge cannot be reduced to a collection of individual knowledge, and collective knowledge is made of knowledge and links between knowledge. Collective knowledge is not a list of subject knowledge; there is a trans-disciplinary and global dimension to such knowledge.

There are different steps in the emergence of collective intelligence. Individual intelligence is not totally isolated, and it aims at solving problems and acting in a society. But individual intelligence is structured, acquired, evaluated, in an individual way. The second step is the one of cooperative intelligence, which makes people able to work together, cooperate, and solve problems they would not have been able to solve alone. Collective intelligence is a third

step, more complex, made of networks of intelligences and which includes a collective dimension in the knowledge, in the problems to be solved and in the way intelligence is activated.

Collective intelligence needs new and adapted tools. Information and communication technology tools are necessary for collective intelligence. The World Wide Web is a very good example of a product and a tool for collective intelligence. But certainly we are at the very beginning of the tools and resources for collective intelligence, and we will have to imagine and design adapted tools for collective intelligence.

Collective intelligence needs collective communication. Communication has evolved from one-to-one communication, to one-to-all communication, and information and communication technologies allow a kind of 'all-to-all' communication. It is an essential component of collective intelligence.

Collective intelligence aims at addressing collective tasks and problems. Future reflection must include the question of which problems and which tasks are appearing in the networked society and need a form of collective intelligence. Collective intelligence is a relatively new concept. Clearly, we have to explore it in its multiple facets, and to reflect on its consequences for education. But this concept is closely linked to networks and their development. The society of tomorrow will probably be a more collective one in terms of knowledge, intelligence, information and communication. Technically, researchers have progressed greatly in the development of 'collective informatics'; they have enabled computers to work collectively and they have defined and designed 'intelligent agents' as a model of collective activity. For education in the networked society, it is necessary for us to build on this, to be able, as human beings, to work collectively and develop collective skills.