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Analytical Survey

# ETHICAL, PSYCHOLOGICAL AND SOCIETAL PROBLEMS OF THE APPLICATION OF ICTs IN EDUCATION


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**Ethical, Psychological and Societal Problems of the Application of ICTs in Education. Analytical Survey.**

This analytical survey presents the results of the IITE project *Ethical, Psychological and Societal Problems of the Application of ICTs in Education*.

The papers included in this volume describe and analyze social, ethical and legal issues that have arisen as information and communications technologies (ICTs) have been used in education. The aim of the volume is to offer ideas and perspectives that will be helpful in steering the future development and use of ICTs. The volume consists of two Parts. Part I provides background material and a history of the ideas that have emerged regarding ethical and legal aspects. Part II examines specific issues.



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# GENERAL

# OVERVIEW

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As we begin the twenty-first century, many eyes are focused on technology and its potential to solve human problems. The hope that technology can solve the problems of the twenty-first century seems justified when one considers the powerful ways in which technology transformed life in the twentieth century. Yet, precisely because of the power of technology, we must be both hopeful as well as cautious about the technologies we adopt and the ways in which we use them. The focus of this volume is on information and communication technology (ICT) used in education. Education is perhaps the most important domain of life for it is the domain in which we prepare people to live and work and contribute to society. Educational institutions lay the groundwork for the future; they prepare students who will become the citizens and leaders of tomorrow. Thus, when it comes to education, we should be especially hopeful but also especially cautious about the ways in which we use ICT.

The papers included in this volume describe and analyze social, ethical and legal issues that have arisen as ICT has been used in education. The aim of the volume is to offer ideas and perspectives that will be helpful in steering future development and use of ICT. The volume consists of two Parts. Part I provides background material and a history of the ideas that have emerged regarding ethical and legal aspects. Part II examines specific issues.

The first paper, "State-of-the-Art in Ethical and Legal Aspects of ICT in Education" by Yuri Voronkov, explains the importance of the topic and briefly describes key issues that have been identified in the field of computer ethics, a field focusing not just on education but on ICT used in many domains. The issues identified by Voronkov include the following:

- Since ICT is powerful, there is a problem with unequal access to these tools;
- ICT may carry cultural and even moral values and yet those who adopt these technologies may not know they are adopting the values;
- Working out the ownership (intellectual property) of computer software is complex and leads to issues about right and wrong in copying and using software;
- Even when behavior is not against the law, there are issues of proper behavior on the Internet, often referred to as "net etiquette";
- Individuals who have computer expertise have professional responsibilities so there should be professional standards and codes of conduct for computer professionals;
- Since computers and especially the Internet lead to globalization, a variety of issues arise regarding how people are affected and what kind of a world will be created.

Voronkov's review of these ethical issues points to many of the important books and articles that have been written on these topics.

In the second part of his paper, Voronkov discusses issues of copyright of computer software and how difficult it is to apply copyright to computer components. Voronkov then goes on to discuss difficulties with regard to achieving global standards for intellectual property. The efforts of the World Intellectual Property Organization (WIPO) and the European Economic Community have not been entirely successful at coordinating policies internationally. This makes it difficult for educational institutions and teachers to know how to treat computer software and data. Perhaps a code of ethics guiding use of computer technologies in education should be developed. Voronkov concludes that while the issues are becoming more and more important, there is too little attention being given to them; much more research and cooperation should take place.

Irina Alexeyeva's "History of the Problem" provides an account of the evolution of ideas that have shaped thinking about the ethical issues around use of information and communication technology in education. Alexeyeva describes this history as involving movement through three ideas. The first idea is that computer technology is necessary to prepare students to live and work in the future. This idea was powerful in encouraging the development of computer literacy and skills. The necessity of teaching computer literacy and skills followed from the belief that ICT would lead to the rise of information-based societies. Thus, teachers should prepare students for life in this new form of society, and that means, among other things, teaching how to choose information, that is, how to figure out what resources are trustworthy.

The second idea shaping thinking about the ethical issues in use of ICT has to do with the accessibility of ICT. According to Alexeyeva, accessibility involves two elements, availability and ease of use. Alexeyeva discusses the evolution of each. Improving availability was achieved through a variety of changes in computer systems including, perhaps most importantly, the development of personal computers and computer networks. Personal computers and computer networks mean that individuals could have access without the necessity of going to an organization or remote location; computers can be accessed at millions of locations where personal computers sit. Similarly, ease of use evolved enormously with user-friendly interfaces and materials. Accessibility has evolved to the current state in which ease of access allows interactive video and CD-ROM to be used for a wide range of educational goals.

Accessibility concerns did not, however, go away; instead, concern shifted to *unequal* access. Since ICT was becoming so important the concern was whether all students would have a chance to learn what would help them in the future. Concerns about unequal access to ICT has focused on differences in schools, to differences between the industrialized and developing countries, to the information rich and information poor, and to differences between men and women in their access to the technology and involvement in computer education and employment. Concerns about access persist and Alexeyeva cautions that although "access to ICT is very important in an information society ... access does not guarantee effective use of ICT in education."

Alexeyeva identifies the third idea shaping thinking about ICT in education as the idea of effectiveness. Is ICT effective in education? Addressing the effectiveness of ICT in education includes consideration of both the appropriate technologies to use and how to use these technologies. There has been an evolution of both. One of the more recent issues is distance education and its effectiveness. Alexeyeva discusses international interest in distance education as a means to improve education in the developing world. She also reviews the debate about the benefits and negatives of distance education and some of the general resistance to using ICT in education. (The topic of distance education is explored in further detail by Philip Brey.)

Alexeyeva concludes her paper with a review of the issues that have arisen around the cognitive effects of ICT in education, that is, the effects of ICT on human capacities and cognitive styles. This review of concerns about the cognitive effects of ICT includes a wide range of issues from the possibility that students will begin to think of themselves as, and behave like, computers, to the possibility of students becoming addicted to computers, to potential effects on creativity and consciousness. It is a list of possible subtle effects indicating, as mentioned earlier, that educators should be cautious in their adoption and use of ICT.

Together, the Voronokov's and Alexeyeva's papers provide the background and introduction to the ethical and legal aspects of ICT in education. The next three papers, comprising Part II of this volume, take up particular areas.

The first one in Part II is my own "Information Technology and the Goals of Education: Making Nails for the Hammer". In this paper I focus on a concern that in the process of adopting and using ICT in education, we will change the goals of education. My concern is that in the process of taking advantage of ICT and the benefits that it offers, educators may change the way they think about their activities and institutions, and this may happen without deliberate choice. I illustrate this concern in several ways demonstrating that the use of ICT can change the goals and values of an activity or endeavor.

Educators should be aware that when technology is brought into the educational environment (or any environment for that matter), it is used to engage in activities that were being done before the technology's adoption. However, over time, as the technology becomes more familiar, users see the potential to reorganize activities to take advantage of the technology's potential. In this second stage, the goals of the activity may change. While the change may be for the better, the important point is that such changes should be made deliberately; educators should not let the availability of the technology unintentionally determine the goals of education.

To avoid this pitfall, I discuss the process of negotiation that should take place as ICT is integrated into education. The negotiation process I refer to here is the process in which educators do not simply adopt ICT because they are available but rather they learn more and more about what is possible with ICT and then match the ICT with what they think is important to achieve in education. I illustrate the danger of simply adopting ICT because they are available and because they are presented as essential. The danger is that educators shift their attention from the content and character of education to its delivery. Since ICT makes it possible (and even easy) to deliver educational modules to distant locations, the goals of education shift to a goal that has become achievable through ICT, but this is to the neglect of the effectiveness of the content and materials delivered.

The metaphor that I use throughout the paper to help us remember the danger of ICT in education is the idea that when you have a hammer, every problem comes to look like a nail. I am concerned that ICT will distort the goals of education insofar as it will lead educators to see the goals of education as those skills and knowledge that can be developed by using ICT.

In his paper, Philip Brey focuses primarily on higher education, arguing that universities should be "generating awareness of ethical issues in the use, development and management of information technology" and he emphasizes that universities should do this both in their computer ethics policies and in computer curriculum.

Brey begins his analysis by identifying a set of issues that have arisen as ICT has come into the educational environment. The six issues are: digital plagiarism; illegal copying of copyrighted media; hacking; improper use of computer resources; harassment and hate speech; and, breaches of informational privacy and confidentiality. Brey notes that these issues arise in part because the type of behavior involved is both easy to engage in and difficult to detect because of the nature of ICT. After describing each of these issues, Brey adds a discussion of the privacy issues that arise when the educational environment is online. Education depends on trust and trust is undermined when there is no assurance of privacy or confidentiality in students' communication with teachers and with other students.

Brey argues that universities (and other educational institutions) need policies on each one of the six issues he has identified. If educational institutions do not adopt policies on these issues, they run the risk that students will, at best, get an ambiguous message about the impropriety of the behavior and, at worst, will get the unintended message that the behavior is acceptable.

Before he directs to what universities should do in the way of curriculum to address the ethical issues arising from ICT, Brey provides a discussion of the importance of academic freedom. ICT both enhance and challenge academic freedom and Brey provides a provocative discussion of the ways in which ICT can do both. He concludes this section by recommending that universities be committed to protecting free speech and that they demonstrate this commitment in their policies. This means that universities should be reluctant to filter, block or monitor communications and should be reluctant to adopt speech codes.

Having addressed the first area for action by universities – adoption of computer ethics policies, Brey turns his attention to curriculum. He begins by framing computer ethics in the broader field that he refers to as social and humanistic studies of computing (SHC) and then distinguishes SHC studies from applied studies of societal aspects of computing (ASC). SHC refers to theoretical research and ASC refers to applied research on societal aspects of computing. Brey argues that both should be a required part of university education. General education is shallow if it provides a view of society without acknowledging the role of ICT; professional education should provide an understanding of the context in which the profession will be practised and often this means a context in which the professional uses and makes decisions about ICT.

Brey describes a program offered at his own university, a program in which students can obtain a minor in ICT and Society. While he does not think this program need be required for all students, he does think a course on computers and society should be required of all students and he elaborates on the topics that should be included in such a course and the books that can be used. The topics that should be covered include such areas as ICT and the economy, politics, law, social structure, culture, and psychology.

Using the distinction between SHC and ASC Brey provides a set of suggestions regarding which students should be required to take which kind of course. In the final section of this paper Brey extends his analysis to secondary school education. The difference in level of maturity of the students seems to justify a difference in how much academic freedom there should be. Since it is unclear what professional role students will have, there is less need for focus on decision making about ICT. Nevertheless, Brey argues that there are good reasons for attention to computer ethics issues in secondary education.

In his "Academic Culture and Business Ethics: Effects on Educational ICTs" Duncan Langford discusses the differences between academic culture and the business world and how these differences impact the use of ICT in education. Langford's paper repeats a theme that every author in the volume expresses, the theme of caution about the effects of ICT on educational environments. Langford introduces the notion of ethical dissonance to point to disruption that can occur as tacit notions of appropriate behavior are not always relevant in environments that involve the use of ICT. His analysis focuses on three major constituents involved with ICT in education – educators themselves,

the companies that produce software, and educational administrators. One potential problem is that the ethical issues fall between the cracks; that is, they may be ignored in the interplay between educators (and their demand or need for ICT) and the software developers (and their pressures to be commercially successful). At the same time, school administrators must deal with educational budgets and must balance spending on ICT with other kinds of spending. Their decisions about ICT are pressured both by financial constraints and by government regulation.

All three constituents make decisions involving ethical issues or having ethical implications. To begin, Langford notes that while educators may acknowledge their responsibility for responsible use of ICT, they often fail to recognize the importance of choosing someone to set up and maintain ICT. The person chosen to maintain ICT in a school has a great deal of power and a great deal of potential to do harm. Issues the maintainer must address include: respecting the privacy of users as email traffic is monitored, setting up an effective password system that has levels of access while maintaining security; deciding whether and how to filter access to the Internet for content such as pornography, bomb building instructions, racist literature, and so on.

While not employed by schools, software developers and salespeople have an important role in ICT in education and yet even if they come from the field of education, because they are in the commercial sector, they have a different perspective. Langford identifies a list of matters about which software companies may have a quite different perspective than educators; hence, educators have to be cautious in their selection and purchase of ICT.

The role of educational administrators in decisions about ICT is often invisible so Langford emphasizes its importance and also the difference between the perspective of a teacher and an administrator. Perhaps the most important role of educational administrators should be to monitor efficient use of ICT and this requires understanding that ICT is not like other kinds of resources.

# STATE–OF–THE–ART IN ETHICAL AND LEGAL ASPECTS OF ICTs IN EDUCATION[1]

***Yuri Voronkov***
***Russian Federation***

## Introduction

UNESCO devotes significant attention to the use of new information and communication technologies (ICTs) and with good reason associates ICTs with expanding new cultural, social, cognitive and professional horizons of education at national, regional and global levels. The use of ICTs could be the most important factor ensuring stable global development.

While recognizing the achievements of and prospects for using ICTs in education, the world community cannot ignore various pitfalls they entail. On the social plane, the trend of developing open and distance educational institutions may considerably limit the opportunities of obtaining education, instead of ensuring equal access to it, due to the undeveloped infrastructure of some regions, the commercial character of educational services and the absence of national languages in ICTs. With respect to educational methods, there is already an acute need for creating different principles for the structuring and selection of educational material available on the Internet. The increase in online courses to 2,500,000 expected by 2003 will make it difficult for an individual user to search and locate high-quality academic material. *Virtual Education* may weaken the communicative structure of education and also disorient students. Many hundred thousand students engaged in virtual forms of education may serve to undermine the academic process, erode academic culture, and lessen the quality of education. The nature and scale of these existing and potential pitfalls and possible ways to overcome them require concerted effort at every organizational level ranging from individual universities and their consortia to the worldwide community. A qualitatively new type of international cooperation is required – not only to define and analyze the situation but also to take action such as by developing specific projects that radically reform education to ensure sustainable development for humankind.

Despite the variety of surveyed sources, all of them are remarkably similar in their objectives regarding the introduction and employment of modern educational technologies. Here are some of these objectives:

1. To intensify the educational process (to shorten the time spent on education);
2. To increase the efficiency of education, i.e. the criteria of evaluating results;
3. To facilitate access to quality education;
4. To provide additional skills unavailable through traditional methods.

When examining the use of ICTs in education, it is useful to consider two interrelated issues. First, for the time being the use of ICTs in education is secondary to traditional methods and is initiated by educational institutions themselves without active involvement of relevant large commercial organizations. It is noteworthy that expenditures for ICTs are exorbitant for educational institutions. Second, in spite of the nearly 20-year experience of using ICTs in education and the progress achieved, the development rate of ICTs as a whole and the enormous need for ICTs in education, we are still in the early stages of ICT implementation. The strategic aspects of ICT use in education will become manifest as soon as ICT use becomes an integral part of education. It is plausible to envisage the development of fundamental educational trends, such as a new understanding of the nature of knowledge, incorporating social and psychological factors, as well as new methods of obtaining knowledge; realization of cultural and historical limitations of dividing knowledge into educational and scientific, natural and scientific, technical, and social and humanitarian categories; the search for new ways of structuring knowledge; an unavoidable expansion of databases, and in due course the merging of databases into a single worldwide system (a kind of integrated global intellect) or a place for universal communication; and a new level of awareness of educational ideas and values.

It is certain that vigorously developing ICTs will change the character of education substantially. Moreover, ICTs are expected to form the basis of a new worldwide educational environment in which national universities will implement their education strategies with the support of ICTs. Such an international environment will have its own philosophical

[1] This paper was written on basis of the information material prepared by the group of authors: Prof. Y. Voronkov, Prof. I. Alexeyeva, Dr S. Kuvshinov, Prof. E. Kravtzova, Prof. V. Konovalov, Dr G. Vitaliev.

foundation, modern multimedia forms of presenting knowledge, and Internet technologies. This environment would not be reducible to the aggregate of individual databases. With time the environment will provide information support for a practically unlimited number of disciplines, and general and specialized courses. It will serve as a necessary means (tool) of the educational process and will gradually develop into both the form and the content of research and educational activity.

## Ethical problems of the application of ICTs

Both special literature on computer ethics and more general literature addressing information society development, values and other cultural issues focus on ethical aspects arising from application of computer technologies in education.

As a scientific trend computer ethics has been developing, mostly in the USA, since the mid-1980s. It focuses on questions of responsibility for defects in the work of software, on preventing access to private information stored in computer databases, centralization and decentralization of power in computerized environments, as well as copyright, intellectual property, and commercial confidentiality issues. Despite a great variety of ethical and axiological concepts employed in this field, it is the categories of responsibility and rights that form the basis of computer ethics. The ethical right and responsibility vis-à-vis computer technology are intricately related – it is not uncommon in other areas of so-called applied ethics – with legal responsibility and legal rights. Legal acts tend to be assessed on their ethical merits, while amendments to existing laws or legal acts or introduction of new ones increasingly require ethical grounding. Such is the broader context for considering specific cases of computer technologies application in education.

D. Johnson in "Computer Ethics" (1985) – a widely acclaimed book – emphasizes the need for a thoughtful approach to the introduction of computer technology in education. She cites inequality in access to information as an undesirable potential consequence that could further widen the gap between the "haves" and "have-nots" both within industrialized societies and between industrialized and developing countries. Moreover, Johnson focuses on computer technologies' potential to promote and even impose on the unsuspecting user a variety of different cultural and moral values. Hence, the need to encourage a reflective and critical attitude towards information transmitted through computer systems. Contributions to *Possessing Scientific and Technical Information* (Weil and Snapper (eds.), 1989) consider issues of intellectual ownership of software within the context of contradictions between commercial norms and academic ethics promoting dissemination, with minimum restrictions, of scientific and educational information. When discussing ethical aspects of computer technologies' application, Weil and Snapper examine the existing legislation and try to elucidate rather intricate relations between ethical and legal rights and various related forms of responsibility.

While some researchers consider legal compliance as a minimum ethical requirement, others question the ethical validity of certain laws that are in practice often violated by computer users. The latter situation is illustrated in H. Nissenbaum's article "Should I Copy my Neighbor's Software". Nissenbaum argues that copying of software for non-commercial purposes can be ethically acceptable even though it could contradict the law. She also expands the traditional interpretation of the ethical base of intellectual ownership and copyright by including in it both the manufacturer's and private user's rights. Nissenbaum proceeds from the conviction that the seller should not constrain the customer's individual choice by imposing on him/her a single model.

The nineties expanded the scope of research in computer ethics to include a new cluster of issues related to the increase in non-professional computer use and development of computer nets. The editors of *Computers, Ethics and Social Values* (1995) introduce the section "The Net World" by asking:

> "As we probe the implications of a world closely connected electronically and increasingly dependent on these electronic connections, it is important that we not sit passively by, watching and predicting what it will all mean, rather than actively engaging in shaping it. We should be asking what form we want these electronic connections to take. Who should have control? What values should the system embody or promote? Who should have access? What social or personal interests should these connections serve?"

Information on the "net etiquette" can be found today in the *Internet User Guide*. The expression "net etiquette" has entered common parlance, and a special web site has appeared on the Internet (http://webethics.com). Internet-related ethical issues, including its use in education, are discussed in a number of specialized publications, such as *Science and Engineering Ethics*, the UK; *Journal of Information Ethics*, the USA; *Ethics and Information Technology*, the

Netherlands; *The Australian Journal of Applied and Professional Ethics*. These journals publish papers on such issues as formatting of Internet data sources to meet the specific requirements for academic and educational sources, as well as building Internet-based electronic libraries.

People of different occupations, age groups and educational backgrounds who live in different countries representing a variety of cultures use resources available through the global computer network. This, however, complicates the problem of developing universal standards of behavior and a system of ethical norms, which could be widely recognized in the World Wide Web. Meanwhile many believe that such a system is really needed today. For example, M. Woodbury in "Defining Web Ethics" (*Science and Engineering Ethics*, 1998, No. 2) maintains that some sort of "traffic regulation" rules is required, which should be clear and easy to follow for both amateurs and professionals working in the Internet. Woodbury argues that present-day net technologies make it possible for people without special training and universally shared ethical standards to become, for example, Internet "publishers". Since Internet browsers are a relatively new phenomenon, there is no effective way to control the quality of such publications or to adopt particular standards. However, earlier mistakes bring awareness of the need for such ethical guidelines. Woodbury believes that the "net ethics" should contribute to promoting ethical standards and increase the probability of ethically acceptable behavior of software developers and Internet users. Thus she stresses that the question of quality of information sources is acquiring greater importance. The quality of information sources used in education should be of particular concern. Their reliability must be ensured. Woodbury defines one of the tasks facing today schoolteachers, university lecturers and librarians as being able to help students navigate in the sea of electronically available information.

Serving originally as the means of data storage and systematization, the computer is increasingly becoming a universal intermediary for gaining and assimilating knowledge. Research shows that computer engineering gives rise to a variety of complex systems (related to a wide range of asynchronous text-based – including video conferencing – systems), which includes the elements of encouraging the student, while at the same time stimulating his effort. Use of ICTs can eliminate space, time, racial, sex, age, and other restrictions standing in the students' and other people's paths of acquiring knowledge.

In other words, the technology combines chat with other students and the teacher, writing, electronic publications and so on. Computer-based methods of education, possessing all the above characteristics and geared towards feedback, form the "Zone of Immediate Development" for diverse educational systems. These can be classed based on a variety of criteria: distance, multimedia, real time, or off-line; meant for professional or supplementary, higher, primary, and secondary education, and so on.

Combining the social orientation of the traditional forms of education (primarily with reference to university-level education where new methods have become widespread) with the flexibility and instant response of individual training, the described educational technologies evolve into a new field of pedagogical practice.

Some American authors suggest that the principles laid down in the codes of professional organizations uniting "computer professionals" (the US term) should serve as the basis for "global net ethics" (very often the ethics of using any computer technology in any sphere, including education). This, first of all, concerns the ethics codes of the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE). These organizations have developed the Software Engineering Code of Ethics and Professional Practice, which is published on the Internet http://www.computer.org/tab/seprof/code.html.

The idea of spreading the rules of these professional codes to a wider circle of software designers and users of computer technologies is supported by D. Gotterbarn in "Computer Professionals and Your Responsibilities: Virtual Information and the Software Engineering Code of Ethics". In Gotterbarn's opinion the professional ethics codes can aspire to a universal – embracing the field of virtual information – status. These codes require from the associated members to carefully consider the rights and well-being of those who are affected by the results of their work, be able to evaluate their actions or decisions from the point of view of the larger public (assuming that the public is reasonably well-informed), to analyze the consequences of their work-related decisions as experienced by the least protected individuals and groups, and to measure their work against the highest standards of software engineering.

The general principles of professional codes are, as a rule, specified in accordance with particular types of activity. For instance, one of the principles of the ACM code says: "An ACM member shall use his/her knowledge and qualification to contribute to human well-being." This rule is specified as follows: "In performing his/her work, an ACM member shall take into account the questions of health, property and people's well-being." In reference to

the work with personal information this rule is amended by further recommendations: "to minimize the collected data", "to restrict a sanctioned access to information", "to ensure the proper safety of information", and so on. It would be useful to consider similar recommendations as applied to development and utilization of computer technologies in education. In particular, this refers to university-automated systems of collecting and processing personal information on students. Designed to increase efficiency of administrative and management processes such systems are widely used in educational institutions and represent a transitional stage to the "worldwide educational technologies".

When looking at problems associated with the application of computer technologies, American scholars often appeal to the "standards of professional ethics" and professional ethics codes. This can be largely explained by the existence of a long-standing tradition of articulation and codification of ethical standards in professional activity in the USA. W. Gellerman, M. Frankel and R. Ladenson comment: "Indeed, the normative feature of professions in our society has traditionally been defined as the articulations of ethical standards." Long before research in computer, biomedical, business and other "applied" types of ethics took off in the USA there had existed influential independent professional societies and associations engaged in formulating ethical standards of professional behavior for their members. Frequently those standards were subsequently codified in ethics codes of the corresponding societies. In the 1970s-1980s the study of ethical issues related to the development of science, engineering, medicine, and economics was accompanied by a growing tendency towards codification of norms within different organizations and professional associations.

However, there exists an opinion that professional ethics codes can inhibit the development of ethical norms rather than facilitate it. Such position is represented in J. Ladd's article "The Quest for a Code of Professional Ethics: An Intellectual and Moral Confusion", which produced a heated discussion within the field of "applied ethics". J. Ladd maintains that the concept of organized professional ethics is at least absurd, both in the intellectual and ethical sense. His argument is based on the understanding of ethics as an open, reflective and critical intellectual pursuit. According to Ladd, ethical principles can be established as a result of research and argumentation, but they cannot be introduced by means of a decree, agreement or pressure. Therefore, ethical principles cannot be established by the leaders of associations, organizations or by consensus of their members. Even if an agreement about ethical principles is reached and they are laid out in a code, an attempt to impose these principles on other people under the guise of ethics runs counter to the very notion of ethics which presupposes that individuals are autonomous moral agents. Therefore ethics itself, says Ladd, "consists of issues to be examined, explored, discussed, deliberated and argued".

Thus the idea that ethical problems of development and application of computer technologies should be reduced to a mere creation of ethics codes seems rather simplistic. J.H. Moor in "What is Computer Ethics?"[2] (1985) attempts to determine the characteristics of computer ethics as an independent discipline. He says:

> "In my view, computer ethics is a dynamic and complex field of study that considers the relationships among facts, conceptualizations, policies and values with regard to constantly changing computer technology. Computer ethics is not a fixed set of rules, which one shellacs and hangs on the wall. Nor is the computer ethics the rite application of ethical principles to a value-free technology. Computer ethics requires us to think anew about the nature of computer technology and our values. Although computer ethics is a field between science and ethics and depends on them, it is also a discipline in its own right which provides both conceptualizations for understanding and policies for using computer technology."

International cooperation in the Internet (including the educational sphere) is discussed in *Internet Ethics*. The Australian scientist J. Weckert, who co-authored the book, believes that the global nature of the net not only opens up new exciting opportunities for the production and dissemination of knowledge but also increases the danger of tensions between values and standards characteristic of different national cultures. Weckert defines cultural imperialism as the use of political and economic power to disseminate values and customs of a foreign culture, which leads to the ousting of national or indigenous values and culture. Weckert takes issue with the Social-Darvinist argument of the "natural" and even useful character of such processes. Socio-Darvinists interpret the replacement of one culture by another as an example of cultural evolution where, like in any other type of evolution, the strongest and most adaptable survive, and the weak perish. D. Rothkopf shares a similar view (http://www.mtholyoke.edu/acad.intrel/protected/rothkopf.html). However Weckert emphasizes that "stronger" does not necessarily mean

[2] This article was first published in 1985 in a special issue of *Metaphilosophy*, a leading American journal on computer ethics. The issue contained the works of B. Betchell, "Ascribing Responsibility to Computer System"; D. Lloyd, "The Frankenstein Children: Artificial Intelligence and Human Values"; J. Snapper, "The Responsibility for the Mistakes Connected with the Use of Computer".

"better". Therefore the replacement of the values of a group with a less developed economy or military capabilities (or less aggressive) by values of a stronger group shall not be hailed as a manifestation of cultural progress. Moreover, Weckert believes that diversity of cultures per se should be regarded as a value. A multi-cultural context of computer technologies produces difficulties in ethical substantiation of legal norms, even those which are believed to be international. Weckert illustrates this by analyzing illegal copying of intellectual property. The notion of intellectual property is not very old even in Western countries. Many other countries attach little importance to it. For instance, in China copying of any objects or works of art has been a respectable and useful occupation for centuries. In many Asian countries copying is perceived as a sign of appreciation of the work done by the author of the original. These cultural traditions are highlighted in papers on the cultural foundations of intellectual ownership, such as "The Morality of Software Piracy: a Cross-Cultural Analysis" by W.R. Swinyard, H. Rinne, and A.K. Kau and "China Traditions Oppose War on IP Piracy" by N. Wingrove. Weckert believes that many ethical problems emerging from the Internet's development are not new in ethics. Systematic study of ethical issues has been conducted for at least two thousand years. Essentially, completely new problems are unlikely to emerge. However, the world net provides a new context for old questions and, therefore requires newly formulated answers. New definitions of many ethical issues are called for by the global nature of the Internet, by the extension of the anonymous sphere, the means of interaction and reproduction, and by its uncontrollability.

Ethical aspects of using computer technologies in education, particularly those related to production of national information resources and ensuring access to these resources are reviewed in papers on information society. The challenge of computer technologies to national languages and cultures was highlighted in the report by S. Nora and A. Mink to the President of France (1978). One of the chapters from the book by S. Nora and A. Mink is entitled "Will the Computerized Society be a Society of Conflicting Cultures?" Believing that the information society will have a less clear social structure and will become more polymorphous than the industrial society, the authors argue that one of the manifestations of polymorphism is the way in which different groups will react to the simplification of language, caused, in particular, by considerations of efficiency of various databases and other electronically mediated means of communication. Thus, opting for a single language, computer technologies contribute to growing cultural inequality. But despite the fact that a single, considerably simplified language would facilitate more sophisticated dialogues, it will, nevertheless, be met with resistance. The acceptability of such a codified language will depend on the individual's cultural level, which will condition a discriminatory effect of telematics. The French authors didn't consider a possibility of satisfactory analysis of those questions within the framework of the liberal approach to the information society (chosen, for instance, by the American sociologist D. Bell). Bell characterizes the information society as "knowledge-based society" where education will become a principal value and will play a key role in the social stratification. Nora and Mink, however, considered the liberal approach to be limited as it considers conflict only in terms of the market, and when conflict exceeds its bounds it tends to return it to its sphere. Therefore prospects for social development are limited to the "tranquilized post-industrial society", where economic abundance and growing equality of living standards will make it possible to rally the nation around the huge culturally homogenous middle class and to overcome social tensions. The French authors regard the liberal approach as pro in guiding the behavior of producers and buyers, but they see it as ineffective in explaining the problems going beyond pure commercial activity and more grounded in cultural models.

When discussing national and cultural aspects of the use of information technology in education it is important to specify if the information society is viewed as having a national or global character. The "globalist" interpretation, of the information society due to a different "perspective" allows to adopt a more detached attitude to arising problems or at least present them in a "softer" way. And yet, the practical consequences of "information and cultural" collisions cannot be completely ignored. Thus, T.V. Ershova, the Executive Manager of the Institute of the Development of the Information Society, notes:

> "The conditions of the intensive use of the global nets give rise to new forms of aggression of more developed countries in relation to less developed ones. A danger arises for whole communities to lose their cultural and national originality, including indigenous language, and consumer preferences and tastes are forced upon the humanity in the interests of a narrow group of people (transnational product companies). Similar to the case of protection of national producers efficient methods of opposing these and other dangers of the information age not in hiding from the global information space, instead they should consist in active involvement in shaping that space." (T.V. Ershova, "Conceptual Issues of Transiting to the Information Society in the 21st Century".)

Two different but interconnected trends can be discerned in contemporary philosophical, sociological, and political science thinking with respect to the processes of shaping the information society. The difference is in academic attitudes

to the social role of scientific knowledge and scientific information. One trend views the information society as "society based on knowledge" and recognizes the importance of scientific and, primarily, theoretical knowledge. This approach is developed in the classical post-industrialism and elaborated in D.Bell's works. Conceding the importance of information "in general" for the analysis of social development, those supporting the other trend link the prospects for social development with the growing role of non-scientific information, with the loss by scientific discourse of its privileged status, and with computer and telecommunication technologies capable of transmitting unauthentic information, disinformation or such forms information which defy distinction between true and false. The latter trend is embodied in the concept of the "mode of information", developed by the American sociologist M. Poster, who follows the post-modernist paradigm.

Of the two academic trends the idea of the information society as "society based on knowledge" can serve as a real alternative to ideologies of national and civilizational egoism which gather momentum against the background of disillusionment with both liberal and Marxist doctrines. The key characteristic of this idea is its potentially universal appeal, the implication of humanity's progressive development to a new stage. The presence of leaders among nations should not be considered as a barrier for other countries that develop at their own pace due to specific features of their political, economic or cultural systems. The fundamental possibility of achieving the stage of "society based on knowledge" by every country depends, for all of them, on scientific knowledge, the international nature of science, and on the processes of "scientification" of technology, economic activity, and politics. Success will depend on how the versatile potential of this ideology will play out in specific conditions of individual and collective activity.

Many US and West-European authors consider issues related to facilitation of access to information in the context of the philosophy of "equal opportunities" and "cultural rights".

The urgency of the ethical dimension in application of computer technologies in education has become obvious with the rapid expansion of computer technologies in education, growth of variety in educational material and forms of their electronic presentation, and the increase in the number of teachers and students who use (or would like to use) computer technologies in their work and studies. The ethical element must become essential in the multidimensional evaluation of the quality of technologies, electronic educational material, information resources and modes of their organization and employment. Such evaluation must focus not only on the quality of the subject, its technical and economic merits but also on the legal and psychological issues. The ethical evaluation of electronic communications in education is acquiring greater significance. Emphasis on education as an important area of computer technologies application is supported by the experience gained by computer ethics, professional ethics and the studies of the information society. At the same time it is worthwhile to conceptualize the accumulated practical experience of teachers and university lecturers, as well as many different educational institutions.

The psychological analysis of man's perception of the computer allows us to assume that, on the one hand, there is certain logic and regularities in the introduction of educational technologies. On the other hand, the use of computers as a teaching means is possible when the user's psychological and other individual characteristics are properly considered.

## Psychological problems of the application of ICTs

Present-day psychology has collected convincing data showing that, for instance, any educational process begins with a certain preparatory stage. At this stage a student becomes acquainted with the material, learns basic notions, and immerses himself in the material that will become the subject of his/her study at the next stage. In the context of this survey those findings can be specified in the following way. When ICTs are used in education students should be prepared for both the subject-matter and the technology to be used. Otherwise, it can be suggested, the psychological conditions for organizing the learning process with computer technology will be inadequate.

Some data show that despite individual experience in using computers, at every transition to a new objective or program with the use of computer technology it is necessary either to assign a special preparatory stage, or to allot time and place in the educational process itself where the student could master this technology as applied to the subject he or she is studying. Otherwise to employ computer technologies as a means of teaching can be less effective.

Yet another issue should be considered as part of the discussion. It is the correlation between technical resources and educational computer technologies and the subject of teaching. At present we are not always able to determine the cause

of the failure to achieve expected results from the use of computer technologies in the educational process when such failures occur. Such negative results can be explained by the fact that the specific learning situation cannot produce the kind of results we hoped for. It can equally be caused by the fact that the employed technologies have limited capabilities and cannot produce the desired effects. And finally, the reason could be in the incompatibility between the content of learning and the use of computer technology.

To find a psychologically valid explanation of the failure and to continue effectively using computers in teaching it is necessary to examine the technological resources employed, the particulars of the educational material (its objectives and tasks) and to compare the subject and the capabilities of the employed technologies to find out if and where the technologies can be successfully used. The purpose of computer technologies application is particularly important. If it is simply the replacement of one type of video presentation by another, it could be useful to consider a comparison between, for instance, the real video presentation and computer-based video.

Yet another important aspect of computer technology application in education is the use of direct and mediated forms of activity. The logic of the psychic development of human being syndicates that first, as a rule, man masters some activity and only later this activity can become mediated. For instance, first a child learns to communicate and only after he/she has mastered the skills of communication, this ability can be used as an educational means. There are similar data on the development and use of games and other forms of activity.

Numerous psychological studies show that the direct mastering of an activity is subject to the certain logic of development. For instance, without mastering direct communication individuals cannot learn to play. If an individual cannot play, he or she will not be able to join in an organized educational process. The peculiarities of mastering computer technologies in education have not received much attention in the literature. Thus, the use of computers in education is rather ad hoc today and has little grounding in scientific analysis. Neither is there evidence of attempts at introducing psychological control over it.

One more comment should be made with respect to the above analysis. Modern psychology divides learning into spontaneous (when a student is learning following his/her own program) and reactive (following an "external") program. As a rule, reactive learning contains some elements of spontaneous learning. In other words, if a student consciously studies based on the external program, it means that he/she needs it. To put it differently, individuals can be involved in the organized educational process only if he or she has some "ownership" over it. Viewed from this perspective, the application of computer technology in education will require a special examination with a view at understanding how individuals learn to use computers and other educational technologies, and how they learn the substantive material delivered by these technologies.

In the past decade or so pedagogy and pedagogical psychology have been debating the question of the collective and individual modes of education. Convincing data have been obtained which indicate that, in considering the effectiveness of learning, the choice between the modes depends on the student's psychic age and on the subject to study. In one case frontal teaching is more effective, in another – work with micro-groups (a group is divided into several teams), still another case would require individual tuition.

Choice between modes of teaching is important for the organization of the educational process with the application of computer technology. As a rule instruction with the use of educational and computer technologies is carried out in educational institutions where the teacher has to work with a group of students. The question of the students' psychic age and need for individual approach in teaching have nevertheless to be resolved in this environment. Otherwise, some students will benefit from teaching without the computer more than with it, while for others its use will decrease the efficiency of teaching. Besides, the collective mode of teaching coupled with computer technologies often does not take into account the peculiarities of communication between the participants in the educational process. Russian psychology has obtained ample data, often used in international research, which shows that the results of learning can significantly depend on the nature of communication between the students in the group and their teacher and on the interaction among the students themselves.

When considering appropriateness of different modes of teaching – collective or individual – it is useful to bear in mind the stage of educational attainment. For instance, individual work with computers is quite suitable for specific training purposes. At the same time when students are just beginning to familiarize themselves with the subject of computer technology or have to learn totally new material, the collective mode could be more appropriate.

The cognitive and emotional components of psychic development will be analyzed as part of the close relationship between learning and psychic development. Particular attention will be devoted to the examination of changes in the individual as a result of learning and the impact of a particular type of teaching. In addition, the psycho-physiological transformations emerging as a result of the educational process will be carefully examined.

Study of the ethical aspects of computer use in education requires reflexive attitude to the values and standards regulating activity in this sphere, articulation of the values and standards important for both individuals and groups, sensitivity to arising tensions and looking for solutions that lead to consensus. Therefore the following are important:

- Value orientations in using computer technologies in education;
- Awareness of value differences and ability to prioritize values with regard to circumstances, communicative situations, organizational and national environments;
- Comparison of educational values with those espoused by computer engineers and suppliers of computer technologies;
- The standards regulating the behavior of individuals and groups involved in developing and use of computer technologies in education.

## Legal problems of the application of ICTs

In the past three decades legal issues related to the use of computer, communication and information-processing technologies have been highlighted in specialized and general interest literature, as well as in popular science literature and periodicals. In the past ten years local and global computer networks – an ideal means for distance learning and teaching – have been also widely used by all sorts of specialists as a major source of information. These same networks are often used by numerous international and national non-commercial organizations and by expert communities for swift exchange of legal documents, surveys, reviews, electronic publications, software, and information on teaching methods.

The copyright system is the most important among the entire range of types of legal protection for the results of scientific and educational activity. Copyright is relevant not only to traditionally published academic papers and teaching aids. For twenty years, copyright has also been applied to such non-traditional intangible media as the information stored in the electronic digital machine. It could only be appropriate if the same copyright norms, adapted to software and databases, were applied to the communication technologies of the local and global networks without too many adjustments.

However, copyright cannot be applied to all information and network program components. While very few questions arise about the applicability of copyright norms to the programs used for processing and communicating information in networks, to various databases placed in the network units, to search systems and technologies, and to works (electronic books, abstracts, instructions on employment, etc.), it is worth noting that copyright is applied exclusively to protect an appropriate work from illegal copying by the third person. If the circulation and distribution of a work does not take place in the net, the mechanism of copyright is powerless to help the legal owner to protect this work. This is explained by the fact that the basic part of the information placed and communicated in any net is protected neither by the author's right nor by any other rights. Individual incidents of the access to information without copying in the limits of the protected work's copyright do not formally violate any rules of the law of copyright. The owner of such information can consider it to be confidential and therefore it can be applied to the rules of the law protecting commercial secrets. As to various methods and modes of teaching in traditional educational institutions and systems of distance education, they are not protected by any law either. Such objects are not protected either by the copyright law or by the licensing law. No doubt the author of any method can publish it openly for general information. In this case the author can get at least ethical satisfaction and can count on the recognition of the fact that he was the first who published it.

At the same time legal means of restricting the unscrupulous competition are often used in the educational sphere. The appendixes to the Conference Final Report give recommendations on restricting unfair competition in processing digital pictures, in distance education, in using multimedia technologies for education and the employment of software in the library business. The final section of the report contains an extensive bibliography and a list of all the participants to the conference, their web sites and e-mail addresses. It is logical that the application of legal rules restricting unfair competition is based on the application of the copyright rules to the traditional educational material and aids and to their up-to-date variants based on information technologies and nets.

In recent years attempts have been repeatedly made to improve the copyright laws in regard to the global nets and information technologies.

An attempt of the World Intellectual Property Organization (WIPO) to conclude an international treaty on intellectual property in respect of the databases has not been driven to the practical implementation. The matter ended merely in the discussion of the draft of the related treaty at the diplomatic conference in December 1996. Its text was supposed to extend the legal protection not only to the structure of the databases but also to the specific information contained in them. It is quite evident that the conclusion of such a treaty would substantially change the relationship between providers and users in the Internet type global nets. An information meeting held in September 1997 confined itself to adopting seven documents of purely informational character. Until now WIPO has not made any active attempts to continue the work. The analysis of the WIPO Copy Treaty signed at the Diplomatic Conference in 1996 shows that its authors proceeded from the generally accepted definition of a database (Article 5 of the Treaty) and the right of distribution (Art. 6). In the USA similar investigations ended in publishing a detailed report on legal protection for databases in 1997. This report offered a rather complete analysis of rules of the related law. The next section of the report analyzed various practical measures supplementing legal protection of copyright by various individual adaptations of the structure of databases, by additional elements of protection in the treaties with users, and by software protecting technologies. Besides, the US copyright legal system is characterized by such an efficient extra mechanism as a system of the obligatory registration of all the works in the Copyright Office. The Report also focused on special features of the related European guidelines and on the international treaty draft, which is being elaborated under the WIPO guidance.

Simultaneously with WIPO the European Economic Community organizations were drafting methodological and normative documents in the copyright field which are applicable to information technologies, including Bangemann's report "Europe and the Global Information Society" published in 1994, numerous recommendations and guidelines, White and Green Papers. New copyright rules which can be applicable to information technologies have not been formulated in Europe either, despite the fact that the guidelines on the legal protection of databases contain some elements of special legal protection. Articles 7–11 of the guidelines form Chapter 3 which defines the object of special protection, the rights and duties of legal users, exclusion from the protection, the special protection clause, and the advantages of the protection based on the special right. The basic article 7 in this chapter envisages a special right to prevent an extraction or a repeated employment of the whole content of the database or its considerable part for the database's maker who made a remarkable contribution into the obtaining, control or presentation of the data forming the base. **Thus, the classical educational technologies and information technologies of distance teaching and learning should be based on the classical approach of the system of copyright.** The legal protection in the country of a work's origin is determined by the national copyright law. Beyond the Russian Federation the legal protection of the same work is provided in compliance with the Berne Convention (I) and the related national law of the country where this work is used, for instance, in the USA, in compliance with its law.

Nobody could assert that such an approach completely meets today's requirements. However, in numerous attempts to "invent" identical situations the legal rules were not successful either on the international or on the national level. In practice many teachers, researchers and book sellers (the electronic trade on the Internet's sites of Amazon.com. type among them) adhere to the recommendation of Art. 139 of the Civil Code of the Russian Federation and to similar articles of the national law of the related countries. According to this recommendation the owner of information of potential and actual value is offered to take his own due measures restricting the access of the third persons to the information. In other words the owner of any kind of information (an electronic book, a program, a database, or copies of works in the traditional forms) should use all the available to him software technologies to prevent the unsanctioned access of the users of the net (various passwords, polls, keys, etc.). As to the online educational programs, teachers happily use similar technologies in many countries, among them the USA, Australia, Canada, and the Russian Federation. Together with individual measures which can be made by the owner of a trade secret information there are also various official recommendations securing confidentiality on the Internet and the recommendations on using such means as electronic signature. The normative documents regulating the processing and the communication of the data of personal nature are also of great importance. By request of the related persons such personal (nominative) data must be kept in secret not only with respect to state officials of any rank but also to the persons taking training in the traditional educational institutions and in the organizations providing services in distance education. Such normative documents are widely distributed in Europe where in the majority of countries there exist relevant national laws. A number of documents regulating the processing of nominative data have been adopted on the European level. In 1990 the related rules were adopted by the UN General Assembly.

A lot of normative and methodological documents pertaining to teaching and learning in the information society have been worked out and published in recent years. White Paper on Education was prepared by the EEC Commission in 1995. Green Paper highlighting a wide range of problems was published in 1996. In May 1999 a minute report on copyright and digital distance education was published in the USA. The report expounds the history of the issue and gives a comprehensive analysis of the nature of distance education. The licensing of the information technologies of distance education, the analysis of the adequacy of the existing laws to the exploited technologies, the elaboration of more precise definitions of the terms and the legal provisions are also in the focus of the report. The report's nine appendixes devoted to different problems contain specific practical recommendations. Hundreds of information sources on the issue of distance education are listed in the bibliographic survey and systematized according to the basic sections.

Thus, the relationship between the principles of pedagogical ethics, the ethics of researchers, engineers and other professionals are of particular significance. The above principles can be used as a basis for compiling a specific code of ethics guiding the use of computer technologies in education. Such a code can be tested in a number of case studies focused on creation and dissemination of the hypertext, multimedia and educational aids in organizations, to the use of electronic libraries, and the practice of academic publications on the Internet.

## Conclusion

This survey of ethical, psychological and legal aspects of the use of ICTs in education has revealed, on the one hand, the growing importance of these issues, and the insufficient attention and low level of awareness of these issues, on the other.

Despite a wide range of available literature and some structures in place, it is not particularly easy to draw a comprehensive picture of the present state of affairs in the field of computer and information technologies application. There is a paucity of literature with holistic analyses of the issues involved; neither are there enough specialists engaged in research and practical aspects of this complex phenomenon. In addition, the survey has revealed a scarcity of original comparable data on particular geographical regions, certain types of education, academic programs and curricula, teaching methods, and so on. Qualitative research of individual issues dominates the research agenda. All this is indicative of an early stage of conceptualization and theorizing in the study of computer and information technologies application in education.

Rapid growth in the use of ICTs in education, establishment of open and virtual universities offering courses to hundreds of thousands of students worldwide provide ample proof of global integration. Globalization of product and services markets is changing the economic situation, while increased cross-border labor mobility and leveling up of the educational standards demand a swift and adequate response from the international community. The *World Declaration on Higher Education for the 21st Century and the Framework of the Priority Actions Towards the Reform and the Development of Higher Education* adopted by the UNESCO World Conference on Higher Education, 1998 represents a strategic response to the historical challenge facing educational systems worldwide. The conference emphasized the need to develop more efficient forms of international cooperation in education through various joint projects.

A series of research projects dealing with optimum structures and environment characteristics, as well as with adequate selection of educational strategies based on specified research agendas have been already carried out. These projects served as the basis for formulating a wide spectrum of further research objectives covering psycho-pedagogical methods as well as articulating qualitative and quantitative criteria of ICT application. On the one hand, these criteria help assess the quality of the information environment and, on the other, facilitate efficient use of available resources to pursue specific educational strategies. Experts agree that the obtained results expand the scope of research to include the ethical and legal aspects of ICT implementation leading to subsequent normative recommendations.

The survey results point out issues of further research. First, there is a need to arrive at some kind of semantic uniformity in various segments of research. A specialized Internet web site and a series of teleconferences could address this issue and facilitate discussion of currently existing conceptual approaches.

It is important to keep in mind that disparate and selective applications of ICTs in education are bound to be short-lived. Dissemination of electronic and telecommunication technologies is a complex and integrated process of simultaneous generation and development of a new information and educational environment, new means of

communication, and a new language. It has no precedents in the past. The evolving conceptual framework has a formative function as it contributes to the development of this process. Playing a specific and ambitious role in education – to create a new reality based on educational systems – ICTs and the relevant ethical, psychological and legal issues of their application acquire particular salience in shaping the future of education as a socio-psychological institution. The survey research results corroborate this conclusion. At the same time they indicate that narrow, non-systematic approaches still dominate and frequently obscure a truly global scale of the discussed issues. Meanwhile a holistic vision of the educational process can generate a tremendous synergistic effect, which may boost systematic research based on specified objectives.

Results of such research combined with information on existing research centres, educational institutions and their activity will become an important factor in creating an international multimedia educational and scientific module to provide assessment of ICT use in education. As this Internet-based module develops, it can turn into the hub for exchanging new ideas and approaches – a crucial process in conditions of rapid and constant change accompanying the merger of ICTs with educational systems worldwide.

# HISTORY OF THE PROBLEM

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Looking back at the history of reflections on ethical, psychological and societal problems of ICTs, one can easily see that some important points remaining topical at present, were revealed in the first discussions of computers and education.

With the early use of computers in education, ethical, psychological and societal considerations found their niche in the reflections on this phenomenon. As a rule, the reflections were intimately connected and interwoven in a broader problem of the relationship of computers and society. In the papers and books of the 50s and 60s devoted to the impact of "a clever machine" on humans, speculative and pre-disciplinary approaches were predominant. In the discussions on the perspectives of cybernetics, very popular in that period, one of the most impressive and provocative ideas was that of replacement of humans by intelligent machines in all areas, education including. Nevertheless, the fancy pictures cannot occupy the place of serious social, ethical and pedagogical ideas underlying the efforts of computer professionals and educators to introduce computer technologies into the practice of learning.

From the very beginning of computer-based education, there have been at least three interrelated ideas that seem to be the most important. One of them is the idea that computer technologies are necessary *to prepare students to live and work in future society*. Another significant idea is that of accessibility of computer technology. This idea has two major aspects – *availability* of technology and user-friendly technologies. The third is the idea of *effectiveness* of computer technologies in the learning process. It implies that students digest school subjects and university courses better with the aid of computers, and that computer technologies should positively influence human cognitive style.

The mentioned ideas were intrinsic to the world-known projects of computer usage in education as well as to a number of smaller projects carried out by computer professionals, teachers and administrators in different countries. However, the practices of implementation of information and communication technologies in education have revealed, alongside with the advantages of new technologies, their side effects and closely connected ethical, psychological and societal issues.

## Preparing to live in future society

Use of computers at all levels of school has been interpreted as a necessary condition for the essential function of education – to prepare pupils to live and work in future society. It is founded on the expectation that, year after year, the role of information technologies in society will become more and more significant. The expectation of computer technologies growth, typical of the 60s, turned into the confidence in the early 80s, due to the upcoming personal computers and process of mass computerization. In that period, the national programs of computerization and informatization stipulating the inculcation of advanced information technologies at every level of school were elaborated in many countries.

Normally such programs envisaged the development of hardware infrastructure (creating computer networks, providing schools with computers, etc.), introductory computer courses, progress in awareness of importance and potentials of advanced information technologies, application of computers in the learning practice, development of computer programs relevant to educational courses. Development and realization of those and subsequent programs to advance information technologies in education occurred under the growing influence of sociological ideas of post-industrialism and *Information Society*.

Information Society, supposedly, is a new societal formation with a *crucial role of information and knowledge*. Science-based industries, powerful information infrastructure, speedy development of computer and telecommunication technologies, widened access to information resources for individuals and groups were recognized to be the most important characteristics of Information Society. Information elevated to the status of strategic resource and capital in the post-industrial society would become available, cheap and handy presented (Bell, D. 1980; Youici, I. 1981; Crawford, S. 1983; Forester, T. 1985; Masuda, Y. 1985).

During more than twenty years, the idea of information society had been gaining more and more impact. It was reflected in Okinawa Charter on Global Information Society signed by the leaders of eight influential countries in 2000. "The policies for the advancement of the Information Society must be underpinned by the development of human resources capable of responding to the demands of the information age," Okinawa Charter proclaims.

Role of school in preparing students to live in the society saturated with information and communication technologies has two major aspects. The first is to help people master computer literacy and skills that become an important condition to get a job and to make successful carrier, a useful instrument in planning household expenses, a way to make one's spare time diverse. The second aspect is the effect of information technologies on the process of learning. It means that information and communication technologies should be used to provide the access to information and knowledge resources needed in the knowledge-based society, and students will digest school subjects and university courses better with the aid of ICTs.

Since the 70s, computer professionals and educators have undertaken considerable efforts to help students master computer literacy and skills. Introductory computer courses taught in universities and secondary school seemed to be a brilliant embodiment of this idea. However, the ways it was implemented by have displayed substantial defects. In many cases such courses were nothing but an introduction into computer programming. Designed to develop constructive computer readiness of the population at large for the era of mass information utilities, the courses caused negative attitude toward computers of those who disliked programming.

H. Sackman gave a typical example of criticism based on his own teaching experience. He found that 26% of 415 cadets in Air Force Academy expressed negative attitude toward computers. The cadets defined such attitude as "the most important insight" achieved in their introductory class experience (Sackman, H. 1975). In the 70s, many educators concerned with the problem of positive attitude toward computers insisted that the organization and practice of introductory computer courses should be changed in a way that would turn them into the courses for future users of computer services, not for would-be programmers.

Even in the mid-80s computers in schools were used predominantly in teaching mathematics and natural sciences; it excited the apprehension that those whose attitude toward these subjects was negative would extend this negative attitude to computer.

Personal computer revolution made computers accessible in a computer centre, as well as in a classroom, at home, in laboratories, and libraries. Students, teachers and parents were important driving forces of the revolution. Direct access to computers and progress of user-friendly software gave a push spreading widely computer literacy and skills.

In the 90s, rapid development of ICTs made possible various forms of computer-based communication involving text, graphics, sound, and moving pictures. Rapid expansion of computer networks and the Internet, global "network of networks", provides the unprecedented access to the information presented digitally.

It was a new challenge for education. Now the use of information technologies is not a mere imperative of *future* society. Educators have to teach students how to manage ICTs used in all sectors of *present* society and everyday life.

Teachers should help students evaluate and choose information, identify sources of information that can be trusted and those that cannot. Students need an instruction how to behave in the cyberspace respecting other people and pursuing their own interests. Since the 80s the authors who write about compute crimes have paid considerable attention to the problem of conduct in the cyberspace. In this context, preventing computer crimes is considered to be a function of school.

With growth of the Internet, it becomes obvious that a bundle of problems concerning appropriate conduct in the cyberspace cannot be reduced to the analysis of situations where someone infringes legal norms. It contains vital psychological and ethical problems, including the problems of ethical rules and social values acceptable by people of different cultures. Electronic environment rapidly changing creates new contexts for old ethical problems. A good idea of "road rules" that would be recognized by all agents of cyberspace activity (Woodbury, M. 1998) seems to be very far from realization.

In the preface to the book "Human Choice and Computers" published in 1975, the editors wrote: "Society should deliberately lead and direct the applications of computers in the image of its most cherished values and ideals rather

than to be unwitting victim of the vagaries of technology and the fluctuations of the market place. Toward this end, the issue is deliberate human choice and continuing social accountability in determining role of computers in social affairs" (Mamford, E. and Sackman, H. Eds. 1975). It seems that such considerations may be extended to the present ICTs manifesting fantastic progress of technology made since the computers of the 70s.

## ICT availability and problem of inequality

Probably, earlier than in any other sphere, in education *accessibility* of computer technology has got a status of a special value of the new epoch. Computer professionals and educators who aspire to develop and use information technologies for education have recognized the importance of two major aspects of accessibility – *availability* and *ease of use*.

A. Molnar (Molnar, A. 1997) considers early projects embodying such ideas. PLATO was the first, large-scale project initiated at the University of Illinois in 1959. The system constructed in the framework of the project had several thousand terminals; it was used for a university, a college, undergraduate education, and elementary school.

Appreciable advance of *availability* was made in the 60s with the development of time-shared systems allowing students to interact with the computer directly, avoiding the necessity to stay in long lines for batch processing.

Regarding *ease of use*, at least two significant developments of the 60s and early 70s should be mentioned. BASIC, an easy-to-use language of computer programming, spread rapidly over all levels of education. LOGO became the language of the elementary school computer literacy movement (Molnar, A. 1997).

With personal computers and computer networks, ICTs became accessible to an enormous number of people. The problem of a "user-friendly" computer acute in the 70s, seemed to have been resolved successfully by the end of 20th century. "User-friendly" and "barrier-free" technologies were rapidly growing. Computer-based multimedia integrated graphic, print, audio, video, and computer technologies into easily accessible delivery system. It gave new impetus to ICT implementation in education. Now computers are considered to be suitable not only in learning of mathematics, natural sciences and engineering but in Humanities and Arts as well. Interactive video and CD-ROM technologies are incorporated into instructional units and lessons; a lot of undergraduate and graduate courses rely on the resources available on CD-ROM and in the World Wide Web.

In many countries, governmental and non-governmental organizations pursue the policy aimed at widening the access to ICTs for larger numbers of individuals and groups; in this context education is considered a sphere of special importance. Nevertheless schools are unable to provide equal access to computer and communication technologies.

Since the 80s, the problem of ICT access has attracted attention in societal and ethical contexts.

The ideal Information Society as well as real uneven diffusion of information and communication technologies effected the discussions of *"new inequality"* in the 80s. New informational inequality turned out to have an impact of information technology on the wider society. First of all, the problem was recognized as a problem of unequal access to computers. In education the problem was taken as a painful one, since it challenged a basic function of school – to prepare pupils to live and work in a society. In Information Society, a computer is no a luxury, it is a necessity. In education, it wasn't mere speculations that caused the need of computer technologies. In real life, initial computer skills happened to be a condition of getting a job more and more frequently, although education as a system was unready to meet such demand. Private schools were better provided with computers than public, children from rich suburbs could enjoy computer at home and at school more than children of poor blocks. It was the evidence that the educational system failed to meet the requirement of equal opportunities in a very important respect. Such conclusion contradicted to the idea that informational era would bring solution of inveterate problems – poverty, unemployment, and social unfairness including. Enthusiasts of this idea proclaimed that equal opportunities would be ensured with equal access to information.

It was revealed that the problem of informational inequality had both national and international aspects (Cash, J.J. 1985; Virgo, P. 1983; Suprenant, T.T. 1987). Informational inequality between industrialized countries, on the one hand, and developing countries, on the other hand, was striking. It wasn't about the number of computers per thousand of people. In developing countries, there were many schools that weren't even electrified.

Evident disproportion concerning the computer technologies allowed a conclusion that such technologies split society into "information rich" and "information poor" (Wilson, A. 1987). As a rule, these were "normal rich" who became

"information rich", and "normal poor" who became "information poor". So wealth and poverty turned out to be reproduced on the new level of technological development.

In the framework of inequality problem, issues of sexual discrimination found their place. Clarke argued that under-representation of girls in formal and informal computer activities was the product of sex differences in the development of attitudes to computers. These attitudes were connected with the role models indicating that computer activities were sex-typed as male. "It was suggested that these attitudes underlie the decisions of boys to engage in computing activity and the choice of girls to remain uninvolved" (Clark, V.A. 1986). In the paper of 1996, V. Scott (new name of V. Clark) insisted that the issues of 1986 were relevant to the issues of 1996, when a computer was increasingly viewed as an integral part of everyday life. Her new study allowed the conclusion that "differences in general ability between males and females are not relevant to computing performance, but differences in beliefs about these abilities remain an important factor in decisions to engage or not engage in computing activities" (Scott, V. 1996). It is significant that in single-sex schools the girls had more positive attitude to computers than did the girls in co-educational schools. Scott explains it referring to more diverse computing experience gained by the girls in single-sex schools.

In the mid-80s the fears that growing information technologies would extend the divide between riche and poor, men and women, and would bring new difficulties to people with disabilities were reflected in the academic literature and press. How would the system of education influence this process? Would it soften social tensions or increase them? Would it meet social demand of equal opportunities in education? These and similar problems relevant to ICTs were articulated decades ago (Dunkan, K; Harris, D. Eds. 1985). They remained topical in the 90s as well as at the beginning of the 21st century.

Now the problem of "digital divide" between countries and social groups within one country is recognized at national and international levels. Okinawa Charter of Global Information Society proclaims: "Bringing the digital divide in and among countries has assumed a critical importance on our respective national agendas. Everyone should be able to enjoy access to information and communication networks". ICTs contribute into the process of globalization in all respects, including economy, politics, science, culture, education, etc. At the same time ICTs become a condition of competitiveness for nations and individuals in the global society. Rapid development of ICTs last decade failed to get over the inequality in access to these technologies and in their benefit.

Although the access to ICTs is very important in Information Society, it should be remembered that the access does not guarantee the effective use of ICTs in education. Do learners gain knowledge more successfully with ICTs than with traditional educational technologies? What should be done to make ICT usage more effective? How do ICTs influence cognitive style? How do they influence the characteristics of personality? What values underlay the efforts to develop and to use ICTs in education? Problems like these have being discussed since the early applications of communication and computer technologies in education.

## Problem of effectiveness

*Active role of a learner* is one of the central ideas underlying the developments of information and communication technologies for education. It was embedded in Computer-Assisted Instruction (CAI), a program of research and development of computer-assisted instruction in mathematics and reading elaborated by P. Suppes and R. Atkinson at Stanford in 1963 (Taylor, R.T. Ed. 1980; Molnar, A. 1997). Intelligent CAI (ICAI) combined the achievements of artificial intelligence, cognitive science and advanced technologies to improve learning and problem solving. Updated modes of CAI often united with CMI (Computer-Managed Instruction) are widely used in different forms of computer-based education. CAI implied individualized instructional strategies and self-paced programs instead of lock-step process of group-paced instruction. With CAI, a learner is able to correct his/her responses through rapid feedback. Modes of CAI include drill and practice, tutorial, simulations, games, and problem solving. The technology enables to keep records of individual's progress, to diagnose errors, to produce corrective exercises.

Early approaches to computer introduction in education provoked different sorts of criticism. Problems of proper use of computer technologies in education and proper technologies for education were on the agenda. Not just technological, but pedagogical, psychological and social aspects of the problems came to light. In the case with CAI, proponents and opponents paid attention to general problems of the pedagogical paradigm (Levien, R.E. 1972; Reinick, L.B. 1983; Oettinger, A.G. 1969). While enthusiasts of CAI believed that the technology would bring each student to his/her maximum, their critics pointed out its shortcomings, considering it to be backed by the wrong philosophy of "technological fix" implying that the application of computers would cure most of ills of education.

Reproaches on BASIC as a language of the computer literacy movement became common in the 80s. Professionals who insisted on its unsuitability for education asserted that this language distorted the nature of computer programming, and students who start with BASIC would hardly grow into good programmers.

In the 90s, with rapid growth of global networks, ICTs gave a powerful incentive to distance learning. It is one of the most appreciable effects of ICTs on education. On the one hand, it generated excitement, on the other hand – critique of ambitions displayed by the proponents of ICT-based distance learning.

Growing demand for distance learning is instigated with globalization of world economy, need of educated employees and improved professional skills. Distance learning is relatively inexpensive (10-25% of analogous program in normal education). In addition, a student keeps working; he/she maintains constant income. Learning in usual environment (at home) is more comfortable and less strenuous than learning outside (McNair. The Invisible Majority: Adult Learners in English Higher Education // Higher education quarterly. Oxford, N.Y., 1998. – Vol. 52, N 2, pp. – 162-178; Caldwell M. Distance Learning Effective – http://www.marshall.edu/parthenon/archives/20011101/n4.html).

In the developing countries, virtual education is in great demand, since traditional education is unable to satisfy the requirements of higher educational level. In Africa, where percentage of young people studying in colleges is the lowest in the world, the World Bank sat up Virtual University of Africa. The idea of this university appeared in 1995; in 2000 there were more than 12000 students (Carnevale, D. 2000).

European national and international organizations devote considerable attention to distance education. Such international organizations as EC (European Council) and OECD (Organization of Economic Cooperation and Development) believe distance learning is a key factor of the access to education and growing competence of individuals. It was reflected in the framework of programs of these organizations in 1995-1999 (Payer, J.C. 1995). Open University of the United Kingdom (UKOU) is very significant in establishing the status and quality of distance education. In the 90s a range of organizations striving to further the development of distance education was established. European Association of Distance Teaching Universities (EADTU), European Distance Education Network (EDEN), and International Council for Distance Education (ICDE) are among them.

Distance education is rapidly developing in the USA (Epper, R.M. 1997; Green, K. 1996). In the Russian Federation, distance education has a long tradition. ICTs give a powerful impetus to this form of education driving it to the new quality (Vasiliev, A. 2001; Kovshov, A.N. 2001).

ICTs have become a dynamic force in distance education. Networks, CD-ROM technologies and multimedia amplify the access to information and knowledge, provide the participants of learning process with an opportunity to have fast feedback, make students' communication with each other possible, produce an effect of attendance in a virtual classroom (Mansell, R.; Wenh, U., Eds. 1998; Moore, M. 1993).

While the enthusiasts of ICT-based distant education proclaim that its quality is equal to and even surpasses "ordinary" education, there are many people among academics and administration who are skeptical about the quality of distance learning.

H. Dreyfus gives a striking example of such critique. He entitled the chapter of his book (Dreyfus, H. 2001) "How Far is Distance Learning from Education?" Dreyfus insists that the presence of a teacher is essential for educational process, and the announcements that face-to-face education will be jeopardized in information age are ungrounded. Dreyfus refers to the position of American Federation of Teachers expressed in the following words: "All our experience as educators tells us that teaching and learning in shared human spaces of a campus are essential to the undergraduate experience" (Dreyfus, H. 2001, p. 32; Gabriel, T. 1996).

E. Ayers shows careful and reasonable attitude toward different forms of education, including those based on ICTs. "Perhaps the first step is to dispense with the idea that the new forms of learning will necessarily displace others. Each kind of interaction between students and teacher accomplishes something unique. It might be useful to think of each form of learning located on the grids of one axis, active and passive learning at the poles of the other" (Ayers, E.L. 2001).

D. Ely in the article "Technology is the Answer. But What is the Question?" puts important questions concerning the implementation of technology in education. The range includes the questions like *How can we create the con-*

*ditions for learners to become increasingly responsible for their own learning? How can we help learners use the tools that are required for survival in technological society? How can we "humanize" technology for the service of all people? How can we help learners ask the right questions?* (Ely, D. 1997; Hosie, P. and Schibeci R. 2001). P. Hosie and R. Schibeci refer to these questions in their review of major approaches to evaluate courseware. They consider such questions perennial, regardless of the technology concerned. Hosie and Schibeci assert: "Despite the large investment in information technology by educational institutions, there is still scant evidence to establish the proposition that the new technologies have led to significant learning gains among students" (Hosie, P. and Schibeci, R. 2001, p. 19).

Effectiveness of ICTs in education depends on what hardware and courseware are chosen, and how they are implemented in the process of learning. Reeves insists that evaluation should not be concentrated just on technical issues, such as quality of graphics and speed of operation. It makes sense to take into consideration such dimensions as pedagogical philosophy, learning theory, goal orientation, task orientation, source of motivation, teacher role, metacognitive support, collaborative learning, cultural sensibility, structural flexibility (Reeves, T.C. and Reeves, P.M. 1997). Leveine suggests that courseware effects on cognitive, social and instructional process should be accounted in evaluation of software (Leveine, T. 1996).

It is essential for teachers' attitude toward ICTs if teachers participate in evaluation of courseware. P. Hosie and R. Schibeci underline that educational courseware is evaluated much more seldom than new computer game, application or utility. "The need for effective evaluation is as necessary today as it was when computers were first used in education" (Hosie, P. and Schibeci, R. 2001).

Educators should do a lot to help the students to take their cue from the era of information technologies. It seems probable that the teacher able to play such role should employ ICTs in learning process. Meanwhile, teachers themselves have considerable problems with integration of ICTs into the school curriculum.

The worldwide survey of W.J. Pelgrum and T. Plomp reveals that resistance to microcomputer innovations has been observed internationally, in all grades of school. Such attitude is contrast to the efforts of a broad cross-section of teachers who are expert and enthusiastic in computer use (Pelgrum, W.J.; Plomp, T. 1991). Many reasons for such attitude have been pointed (Sheingold, K. 1987; Wiske, M.S.; Zodhiates, P.; Wilson, B.; Gordon, M.; Harvey, W.; Krensky, L.; Lord, B.; Watt, M.; Williams, K. 1988; Hativa, N. 1991).

N. Hativa summarized the factors that either promote or impede the integration of computers into classroom teaching (Hativa, N. 1995). The list of the factors impeding computer integration includes such items as *inconvenience of the access to software, inconvenience of the access to hardware, difficulties of classroom management, curriculum-related impediments, extra-burden on teacher time and effort in lesson preparation and planning, inadequate training.* One more important factor identified by Hativa (as well as by other authors) is *a change of teacher's role*. For centuries, teacher-centred classroom was the way to maintain order and teach an extensive amount of instructional content; direct interactions between a teacher and students implied a sort of psychological rewards that came from teaching.

K. Sheingold, M.W. Martin, M.E. Endreweit summarized psychological problems related to a teacher in the following words: "Teachers were afraid of the complex, technical nature of the microcomputer, of not being able to use the software and of not being able to understand how computers work. They were afraid that their students would do no more than they did about computers. They were intimidated by how expensive the computers were and were afraid that they or their students would damage them" (Sheingold K., Martin M.W., Endreweit, M.E. 1987, p. 18).

Hativa's list of factors promoting computer integration into the school curriculum includes such items as *teachers' positive attitude toward the use of computers in classes, prolonged prior experience with the actual integration of computer work into classroom teaching, having high motivation for teaching and for their own development as teachers, receiving considerable support from their school and district in their efforts, being committed to students learning on the basis of their experience with the students' effective use of software tools and learning, having access to sufficient quantities of technology, working in schools with more sophisticated technologies.* Hativa consolidates with the authors who consider that to overcome the impediments to integration of computer technologies in school it would be wise to avoid radical changes in what teachers already do and in the cost-effectiveness of teachers' time and energy. It should be taken into consideration while evaluating computer technologies. In this respect, some technologies have advantages over others. For example, "electronic board" keeps a teacher at the centre of instruction, enhances teacher's performance, and saves teacher's time and effort.

## Cognitive effects

Numerous applications of computers in education have revealed a range of psychological problems. One of the most known is the problem of impact of information technologies on human capacities and cognitive style. Optimistic prospects of development of human creative capacity were argued with the references to broader choice and liberation from a burden of cumbersome calculations provided by computer technologies. For example, computer simulation allows students to explore alternative choices getting answers to "what if" questions and learn from their own experience with the aid of computer models of real-life situations.

Beneficial influence of computer technologies on human cognitive style and conduct seemed essential to students in the countries where modernization was recognized as an urgent problem. In the book *The Computers and Africa: Applications, Problems and Potential* (1977) the cognitive changes were pointed to as a potential of implementation of computer technologies in education. R. Hill, one of the book's authors, wrote about beneficial influence of problem solving: "Problem solving teaches the students how to use the computer as a tool quickly, efficiently, accurately determine answers to complex problems or to assemble the facts needed to reach a solution. It also fosters a better appreciation of the steps involved in logically approaching a solution to the problem" (Hill, R.L. 1977, p. 229).

At the same time, anxieties about psychological effects of computers manifested. Some of the concerns sprang from the observation and study of the cases when the mode of thought of children and teenagers became *"computer-like"*, when *self- and other humans' behavior was interpreted in terms of computer's work*. In the mid-80s, the researchers in many countries investigated such phenomena as *deformation of emotional sphere, social isolation, and tendency to computer crimes*. G. Hassing presented a view typical of the discussions of computer negative effects. These effects supposed to be *"automation" of human being, technocratic thought, and decrease of cultural level* (Hassing, G. 1987). D. Smith and M. Seidt (Sautgempton University, Great Britain) in their report to the 4th World Conference on Computers in Education (1985) insisted that the study of the influence of linguistic and procedural structures embedded in computers on children psychology should be considered a priority.

It revealed that some pupils were unable to adjust themselves to computer-based learning process due to their cognitive characteristics. *Children with restricted abilities, ethnic and cultural peculiarities* met difficulties threatening to exclude them from the system of computer-based education. In the mid-80s the impact of information technologies on human psychology was articulated as a problem of computers and education that was of wide social impotence.

ICTs' influence on psychological activity has been studied throughout the world.

With the early use of electronic calculators the phenomenon of *"exutio"* was identified. Latin word "exutio" means "withdrawal", "immobilization". Gradual extinction of counting ability is the most known example of exutio. Psychologists have evidences that make for extinction of competing ones. Easy access to information forces out the self-dependant production of new knowledge. Use of statistical packages determines the ways of perception and processing of information (Babaeva, Yu.D., Voiskunsky, A.E. 1998, pp. 89-100).

In the 90s I. Goldberg coined the term *"Internet Addiction Disorder"* to describe the addiction to the Internet and created a support group for Internet addicts. The term provoked debates among psychologists (Young, K.S. 1998). However many people had been addicted to their computers long before they became Internet users. Many people are addicted to their computers even if they do not spend much time in the Internet. So, it makes sense to use the terms like *"Computer Addiction"* or *"Cyberspace Addiction"*.

Considerable research and controversy has been focused on the issues concerning general strategies, acquired by students in computer environments.

It is widely recognized that applications of ICTs in education help students acquire specific knowledge – facts, rules and context-bound strategies. However in the computer environment a student acquires general strategies, such as *means-end-analysis, visualization, and meta-cognition*. How do such strategies influence the student's thinking? In this respect, Information Processing Technologies (IPT) are demonstrative (Mevarech, Z.R. 1995). IPT is the software explicitly designed to facilitate complex cognitive process across domains. This technology was highly evaluated by some cognitive psychologists who believe that engagement in IPT impart important concepts like a notion of multiple

solutions to a given task, reflective analysis of process and products, the right to err, and flexible revision of initial approaches (D.N. Perkins. The Fingertip Effect: How Information Processing Technology Shapes Thinking // Educational Researcher. 14 (1985), pp.11-17). Z. Mevarech argues that in the evaluation of influence of certain technology on creative thinking both theoretical and empirical aspects are important. She realizes such attitude in the empirical study examining the affects of a certain Application Based Cooperative Computer (ABC) environment on *students' creative thinking, problem solving, and perceived competence.*

Idea of active role of a student underlies various developments of ICTs for education. It implies that computer technologies contribute to transformation of educational process to non-authoritarian forms of collaboration of a teacher and students overcoming "teacher's dictatorship" and impelling students to self (computer)-supporting research and self-realization.

Nevertheless the access to ICTs does not guarantee the development of human intelligence, analytic and creative capacities.

In the 70s apprehensions of negative affects of computers on cognitive style concentrated on the excessive *love to calculations involving tendency to present all human problems in abstract formal models.* Alarms typical for the 90s concern the enthusiasm for *visualization and symbolization of knowledge.* While some educators greet this tendency asserting that the trick is not to turn experience into abstractions with a computer but to turn abstractions, like the laws of physics, into experiences (Dissea, 1986; Molnar, 1997), others insist on the value of classic approach according to which the content of *basic concepts* of cognition and science is pretersensual and *non-suitable for visual demonstration* (Gromyko, Yu.V., 2001). Present use of ICTs contributes to shaping of *"clip consciousness"* hampering the development of analytical capacities. Clip consciousness, splintered and unable to be focused on the same topic for a long time, is opposed to scientific consciousness. The second one has its own defects (including technocracy, narrowed understanding, naturalism, limited axiological matrix), but the first one is more primitive, suitable for easy shaping and cultivation. Abstract thought is essential for science; ousting scientific and scientifically oriented consciousness by clip consciousness might question the perspectives of human mind.

V. Lectorsky asserts that the book culture replaced by audio and video culture will have serious consequences. One of them will be an emerging new type of personality whose *awareness of self-identity will be slight, or will even disappear.* Another effect will be the undermined position of science. The last comes into contradiction with the key position of knowledge in Information Society (Lektorsky, V. 2001).

It has been widely recognized that proper applications of ICTs in education should support *development of personality increasing individual's potential, widening her/his social and intellectual choice.*

Ethical and societal ideas as well as psychological considerations underlay the efforts to develop and use ICTs for education since the early cases. With progress and spread of ICTs ethical, psychological and societal problems have drawn more attention of scholars and educators. Reflexive attitude toward values and ethical rules relevant to ICT-based education as well as the attention to psychological effects and background of ICTs are urgent in the information era. The agenda comprises methodical research, including the development of theoretical base adequate to the practice undergoing constant change, coordinated efforts of theorists and practical workers, administrators and policy-makers.

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PART II

# SELECTED MATERIALS

# INFORMATION TECHNOLOGY AND THE GOALS OF EDUCATION: MAKING NAILS FOR THE HAMMER

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## Introduction

As information and computer technology (ICT) is used more and more in educational institutions, a wide range of ethical issues arise – issues having to do with access, ownership, accountability, privacy, and other general effects of the technology on human well-being and social organization. In this paper, attention will be focused in particular **on the goals of education.** Education aims to improve the lives of individuals by giving them the tools they need to think for themselves and make decisions about their lives. In this respect, education goes to the core of what it means to be human; it facilitates individuals in developing their hopes and desires and their capacities to reason, make choices, and act on those choices. Education is both intrinsically and instrumentally valuable. It is intrinsically valuable insofar as it improves the quality and character of human lives and it is instrumentally valuable when it provides knowledge and develops skills that enable students to work and function as citizens. Because education is so valuable, it is extremely important that the adoption of ICT in education does not distort the fundamental goals of education.

In this paper I examine some of the potential dangers of adopting ICT in educational environments. In doing this, I acknowledge that technology has the capacity to change the environments in which it is used. Adoption of a new technology, or a change in the technology used, can change social relationships, the distribution of power, the ends served, and the values promoted or suppressed in an institution. Indeed, scholars of the Technology-society relationship often refer to Marx's statement of technological determinism. According to Marx, "the hand-mill gives you society with the feudal lord; the steam-mill society with the industrial capitalist" (Marx, *The Poverty of Philosophy*). While Marx may have over-stated the technology-society relationship, that there is a relationship between the technology used in an institution and the institution's values seems undeniable. Technology has a powerful influence on the character of the social institutions in which it is used. Of course, technologies do not arrive from nowhere; they are developed and adopted for a variety of reasons; they are developed and adopted as a result of a variety of cultural, social, political, and economic forces. Origins aside, the focus here is on the effects of adoption of ICT in institutions devoted to education.

My broad concern is that in the process of taking advantage of ICT and the benefits that it offers, educators may change the way they think about their activities and institutions, and this may happen without conscious choice. Unless we are careful and resist the temptation to adopt whatever is available, ICT may change the goals and values of education for the worse.

ICT is generally seen as a tool of the future – a tool for solving problems and making institutions better – more efficient. Public acceptance of ICT seems to embrace the idea that if an institution (such as a school) or a group of individuals (such as students) are to be successful in the future, they must learn how to use and make use of ICT. That people hold this belief cannot be denied. The concern of this paper is that when educational institutions, school administrators, and teachers accept this idea, they may *re-define* their goals and their problems in forms that make it possible for ICT to be the solution. This re-casting of what education is and what it aims to achieve can result in unintentional degradation of the foundational goals of education. To use a metaphor, if the tool we have at hand is a hammer, we are likely to see our situation in terms of nails.[1]

## Background

How could the availability of a hammer (ICT) lead us to see our goals – the goals of education – as nails? To see how this might happen, we need to step back and consider more generally how ICT transforms society. In his seminal article, "What is Computer Ethics?" Moor (1985) identified two stages in technological revolutions. In the first stage, new technology is introduced, tested, and its use is established. In the second stage, the technology comes to permeate the environment; it is integrated into various activities, practices, and institutions. Only in the second stage, according to Moor, is fundamental transformation likely to take place. In the first stage, the technology is used primarily to do things

[1] I am grateful to Jim Moor for suggesting this metaphor when I was explaining my paper to him.

in the way they had been done before, only more quickly or efficiently. In the second stage, according to Moor, the basic nature or purpose of an activity or institution may be changed. Moor illustrates the second stage with a number of examples and one of his examples is education. He writes:

> "Still another likely area for the transforming effect of computers is education. Currently, educational packages for computers are rather limited. Now it is quite proper to ask 'How well do computers educate?' But as teachers and students exchange more and more information indirectly via computer networks and as computers take over more routine instructional activities, the question will inevitably switch to 'What is education?' The values associated with the traditional way of educating will be challenged. How much human contact is necessary or desirable for learning? What is education when computers do the teaching?" (Moor, 1985, p. 272)

It is interesting to contrast this discussion of education with a claim Moor made in an earlier article "Are There Decisions Computers Should Never Make?" (1979). In this article, Moor suggests that it would be wrong to allow computers to make decisions about human goals and values. He writes:

> "Computers should never decide what our basic goals and values (and priorities among them) should be. These basic goals and values, such as the promotion of human life and happiness, decrease in suffering, search for truth and understanding, etc., provide us with the ultimate norms for directing and judging actions and decision making." (Moor, 1979)

In the first quotation Moor claims that computers may transform institutions in a way that raises questions about (and leads to a redefinition of) the meaning of an endeavor, and in the second quotation, Moor claims that computers *should not* decide goals and values for humans. Moor may try to keep these ideas separate; the first is, indeed, descriptive or predictive and the second is normative. However, the implications of the one do seem to point to the other. That is, Moor's account of how computers can transform institutions such as education points precisely in the direction of human goals and values being changed as a result of computerization.

Consider an example outside the domain of education. As our financial institutions have become increasingly electronic, the meaning of the term "money" has to be understood differently. Instead of coins and paper or gold held in a vault somewhere, money is now, largely, electronic impulses. What it means to 'possess money' in the 21st century is very different from what it meant to possess money in the first half of the 20th century. In this respect money and the institutions around it have changed fundamentally. If the same sort of change takes place in education as ICT comes to permeate, then what it means to be 'educated' will be very different in the 21st century as compared with what it meant to be 'educated' in the 20th century. Change, of course, is not a bad thing in itself. Some of what students need to know to live in the 21st century is different than what was needed in the 20th century. The question is whether ICT will influence educators to change the goals of education in ways that make it better or worse. The concern of this paper is to make sure that ICT does not divert education from its most important goals.

For now, however, my point is only that the use of ICT in education can lead to subtle and unintentional changes in the goals and purposes of education – changes that have not been explicitly or consciously chosen. My concern is that the availability of ICT (and the social pressure to use it) will lead human beings to change the goals and values of education without realizing they are doing so. Thus, the influence of ICT on the goals of education should be carefully watched and evaluated. How, we must ask, is ICT influencing the goals and values of education?

## Education

The goals of education vary a good deal depending on the age of the students and region in which they live. Yet there are certain foundational goals that remain constant. Education minimally aims at literacy; it aims at socialization for citizenship and this, in turn, generally involves providing a historical and cultural understanding of the world in which students will live as adults; education aims at the development of critical thinking skills; education aims to equip students for careers and self-realization. These goals are broad and interrelated. They provide a foundation for ongoing education and development. Given the diversity of individual students and what they bring with them to the classroom, achieving each of these goals is a daunting task.

If ICT can help educators achieve these goals then ICT has a great deal to offer. My concern is, however, that we must be cautious in the way we use ICT in education, or the technology will skew attention and resources away from the most fundamental goals.

To illustrate my concern, I begin with a simple observation. ICT has not come into education from the bottom up. That is, ICT was not created in direct response to problems in educational systems. Indeed, it is naïve to think that technological innovation always comes about in response to prevailing needs and desires. An adherent of this naïve view might argue that technological innovation comes about when the market or government responds to the needs and desires of consumers and constituents. Of course, we can imagine educational innovation coming about in this way. Imagine educators working very hard to solve the problems that confront them, articulating their problems, and then engineers and scientists taking up these problems and, in response, developing techniques and tools that solve the problems. This is not, however, the way technological innovation always occurs, nor is it the way ICT has entered the domain of education.

The model that describes what has happened with ICT in education is much more complex and closer to the following. Computers were developed initially in one context and later their applicability to many other contexts was recognized. Computers were promoted as a general purpose machine that would allow companies and individuals to do things more efficiently and effectively, on a larger scale, less dependent on human labor, and so on. The story of the Internet's development follows a similar pattern with its initial development in a military context and it later being taken up by universities and then by the world of business.

When it came to education, ICT was strongly promoted, both by the ICT industries, by government, and by the media. In the U.S., at least, the computer industry promoted the use of computers in education via a variety of programs that gave computers to schools; state and federal governments offered grants to schools to encourage the use of ICT and to develop innovative applications. The media portrayed ICT as 'the technology of the future'. Remember here Al Gore's speeches in which he described the information infrastructure as "the superhighways of the future". Thus, educational institutions turned to ICT in part because government, industry and the media gave them incentives to turn in this direction.

Admittedly, if there were no fit whatsoever between ICT and education, these programs promoting the use of ICT in education would not have succeeded. Educators and educational institutions have been able to find and create ways to use ICT. This is because the goals of education are complex and somewhat fluid, so that educational administrators, school principals, and teachers are able to find problems that the technology can solve. To use the metaphor introduced earlier, since educators have a variety of goals and problems, when they are offered a hammer, they can find a problem that look like a nail.

Educators and educational institutions must make difficult decisions about how they are to achieve their complex goals and these decisions often involve choosing how to use limited resources. ICT is offered to them via grants and other government and industry programs and in order to take advantage of these opportunities, educators and educational institutions choose to pursue those goals achievable by ICT. In this way, educational institutions may end up pursuing goals that were not necessarily of high priority. In the worst case, the result is a misallocation of limited resources.

The process in which ICT is brought into the domain of education is critically important here. In order for ICT to be integrated into education, a match – a fit – must be made between the goals of education and the capacities of ICT. Matching the goals of education with the capacities of ICT can be thought of as a negotiation process. Educational institutions want the benefits of ICT but may have to change what goes on in the classroom, whom they hire as teachers, how they allocate space, and so on in order to make use of the technology. The ICT that has already been developed may not be exactly suited for the educational context. Thus, ICT and education have to negotiate a fit.

Of course, this negotiation process has taken place – in the last few decades – against a backdrop in which ICT was promoted, as mentioned earlier, as 'the technology of the future.' There has been a covert threat visible in the media and in state and federal governments' justification for investing in ICT; the threat was that if educators and educational institutions did not take advantage of ICT, their students would lose out. ICT was seen as an inevitable, powerful technology upon which the world would come to depend. Hence, if students did not learn how to use computers, to navigate computer systems and the web, to manipulate spreadsheets and search engines, and so on, they would be at a great disadvantage in the future.

This technological imperative pressured educators to figure out how to use computers in education, and how to match the goals of education with the capacities of ICT. It is this process that opens up the possibility of change in the way we think about the goals of education. In this process, the goals of education can be shaped into "nails" so that "hammers" can be used to achieve them.

Moor (1985) predicted that in the early stages of this negotiation process, the use of computers is not likely to be revolutionary or transformative; in the early stages, the most primitive functions of the technology are tapped. For example, in the early stages of computers in education, computers were used for such things as drill and practice, or to find information in CD-ROM encyclopedias or on web sites. These activities were part of education before computers – drill and practice was done with students and teachers, and information was sought out in books. With ICT, these activities are performed more efficiently, more conveniently, and more expansively.

Only later, as Moor suggested, would we expect to see ICT being used in ways that change the fundamental character of education, the way education takes place, and our understanding of the goals and purposes of education. These more fundamental changes are now beginning to occur though they are still subtle and only barely visible. We now have to be careful about education becoming the nail, so that the hammer can be used.

There are a variety of ways in which this process of new technology adoption can go. First, educational institutions and educators could adopt new goals because computers make it possible to do things that couldn't be done before. Second, the same educational goals could be kept intact and ICT used to achieve these goals. Here we can imagine a process of examination of ICT to see which if any educational goals can be achieved (or better achieved) by using ICT with the possibility of selecting or rejecting it for various purposes. Third, a negotiation could take place between educational goals and ICT in which both are modified. Educational goals are, as I mentioned before, complex and fluid. Hence, the capacities of ICT could be matched with educational goals in ways that modify the goals and require modification of ICT so that it is used in new ways.

All three of these processes can be seen at work in our educational systems today. For example, computer literacy has been adopted as a new educational goal. When used for drill and practice, ICT is used to achieve a pre-existing goal, the goal of mastery of certain skills and content. Here, it is claimed that the technology does something better (more efficiently) than a teacher. However, it is the third model of technology adoption with which I am most concerned. Here the goals of education are modified so as to take advantage of the technology and the modification involves neglecting or disregarding more important educational goals. Later I will focus on equal access as a goal that has become more prominent as a result of the availability and capacity of the Internet and, to some extent, this has happened to the detriment of quality of education.

## The potential benefits and the potential threats

The process wherein school administrators and teachers learn about ICT and what it can do while simultaneously thinking about what they are trying to do in their schools and classrooms is a process with enormous potential benefits. In order to adopt ICT, educators are compelled to think about what they are doing and match it with what they know about the capacities of ICT. This process calls upon educators to articulate their understanding of the goals of education and their assumptions about how these goals can be achieved. This activity of making goals and strategies explicit is very powerful. Indeed, the activity can have powerful effects even if ICT is never adopted. As educators make explicit and articulate their understanding of the activities in which they are engaged, they acquire much more control over the activities.

I first noticed this effect of computerization in the early 1980s when I learned about the processes and activities involved in bringing computers into businesses. In order to automate a company's activities, company representatives had to explain to computer system designers exactly what the company was trying to do and how it went about doing it. In effect, company representatives had to explain the company's goals and the strategies it had adopted to achieve these goals. This would include how the company organized itself, its budget and planning system, its record keeping system, its order processing system, its distribution system, and so on. Computer systems designers had to understand all this in order to design software to take over (and make more efficient) these various activities. In the early days of computing, this understanding of a company's processes might be translated first into a flow chart of activities with step-by-step decision points and decision branches. Inevitably it meant translating the flow charts into design specifications for software that could perform tasks and facilitate employees in performing other tasks.

What is rarely recognized is that the 'laying-out' of business processes – so that they could be automated/computerized – had enormous value for companies even if they never automated. The 'laying out' of their activities gave companies the ability to see inefficiencies and mistaken strategies that had been invisible. The process of articulating and making explicit what the company was doing gave the company a degree of control over their activities that they had never before had.

This seems to be precisely the positive potential of ICT in education. In order to take advantage of ICT, school administrators and teachers must ask what they are trying to achieve and how ICT might help them achieve it. In other words, the introduction of ICT into education calls upon educators to re-visit, articulate, and make explicit the essential components of (and the goals of) education, so that ICT can be used to make it more efficient and better. The process, even without the adoption of ICT, has the potential to bring better understanding of education, and consequent change and improvement.

Nevertheless, the potential benefit comes with serious dangers. Not only does ICT call upon educators to lay out (articulate, make explicit) the goals and activities essential to education; it calls upon educators to articulate goals and strategies in a form that matches the capacities of ICT. The danger here is the danger of making education look like nails so that the hammer can be brought to bear.[2]

## The Internet and delivery

This point about how the goals of education can be shifted as a result of the availability of ICT is illustrated by considering what the Internet has done to education in the U.S. In the late 1980s and 1990s, the Internet was seen as having the potential to revolutionize American education by providing equal access. The Internet was presented as a revolutionary technology – a technology that would transform the global order. Among other things, it was presented as having the potential to make the dream of universal access to education a reality both within the U.S. and globally.

In his 1994 speech to the Superhighway Summit, Royce Hall at UCLA (Los Angeles, California), Al Gore, then Vice President of the U.S., said:

> "We cannot tolerate ... a society in which some children become fully educated and others do not; nor can we tolerate a society in which some adults have access to training and lifetime education, and others do not... Nor can we permit geographic location to determine whether the information highway passes by your door. I've spoken often about a vision of a schoolchild ... being able to come home after school, turn on her computer and plug into the Library of Congress... We must work to ensure that no geographic region of the United States, rural or urban, is left without access to broadband, interactive service."

Later in 1998, with a sense that many of the goals of the national and global information infrastructure had been met, Gore challenges the global education community to do more:

> "In Thailand, a group of students with disabilities use the Flying Wheelchair Bulletin Board to talk to other students with disabilities around the world... In Longbeach, Australia, a woman named Christine Chapel lives on a sheep ranch in the Australian outback. By telecommuting through the GII, she recently earned a bachelor's degree at a university more than 1,500 kilometers from her home... We have a chance to extend knowledge and prosperity to our most isolated inner cities, to the barrios, the favelas, the colonias and our most remote rural villages; to bring 21st Century learning and communication to places that don't even have phone service today..."
>
> "Today, some of the most forward-thinking companies are using new *'knowledge management'* techniques that share best practices and take advantage of accumulated knowledge. Today, I issue a challenge to the education community to use these same techniques to link practitioners, experts, and nonprofit organizations that are working on our most pressing social and economic needs. For example, in the world today, five billion people don't have access to secondary and higher education. If we can create a 'knowledge network' that extends distance learning around the globe, we can quadruple the number of people who have access to higher education and lifelong learning."
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> [15th International ITU Conference on October 12, 1998, http://www.itu.int/newsarchive/press/PP98/Documents/Statement_Gore.html]

Of course, access to information and access to education are not one and the same. Even so, the idea of a national and global information infrastructure later came to be understood as a mechanism for delivering first-rate education (the best courses with the best teachers) to educational institutions across the globe. Students in poor schools, in economically deprived regions could, then, have access to the same education that students in wealthy regions and

[2] Nails and hammers aside, my point here is parallel to Ellul's (1964) point about how the means become the ends in a technological society.

communities had. The new system of delivery has come to be known as 'distance education', and distance education is still thought, by many, to hold the promise of equal access to education.

The problem is that in matching the capacities of the Internet with the goals of education, delivery became a high priority and, to some extent, the emphasis on delivery shifted attention away from the quality or content or character of the education delivered. Certainly, some of the resources put into delivery of education were taken away from the pursuit of other goals. Access to education is, to be sure, an important goal; however, this goal is secondary to the quality of the content delivered.

The problem is twofold. First, equal distribution is only good if what is being delivered is good. As already explained delivery is a secondary goal, contingent on the quality of the education delivered. Second, good education is education that achieves its goals but this can only happen when the education is designed for the students. Students across the world vary enormously in ability, in what they know, in the skills that they already have, and in the personal and cultural beliefs they bring to the classroom. Consequently, the same tools and materials cannot be used with all students, even all students at a certain level. A given set of teaching materials can be enormously effective with one set of students and useless to another. The value of delivery of educational materials is contingent upon what is delivered and to whom it is delivered.

An old story helps to illustrate how the Internet has shifted the goals of education. Imagine a person leaving work in the evening when it is dark; she walks along and comes upon a friend who is bent down, apparently searching for something in the grass, under the light of a lamppost. The woman asks her friend what he is looking for and the friend explains that he dropped his keys and can't seem to find them. The woman offers to help and begins looking in the grass near her friend. After some time without finding the keys, the woman inquires of the friend, "where exactly did you drop the keys?" The friend replies by pointing to a spot some fifty meters away. "Why, then, are you looking here?" she asks. Her friend explains that he is looking there under the lamppost "because there is light here".

The story illustrates a human tendency to look where there is light; that is we tend to put our efforts into solving problems that we know how to solve. So it is with ICT and education. Because of the availability of the Internet, universal delivery becomes possible. Because we know how to do this, we give attention and enormous resources to delivery, and our attention is diverted away from goals about which we are in the dark, such as attending to the wide range of needs of students, figuring out how to achieve literacy, and so on. Many of the most important educational goals are difficult to achieve for economic, cultural and political reasons, not a lack of technology.

Thus, the availability of the Internet has turned attention to equality of access, and away from fundamental literacy and other goals of education. The public discussion of the Internet and education in the 1990s seemed to assume that what constitutes a good education was already known, that universal literacy was already achieved, that students' needs could be fulfilled simply by access to information. The focus of attention was on *how* educational modules, lectures, teachers, and experiences could be made available to students, and not on what should be made available and whether access to information would do an adequate job.

Again, this is not to say that equality of access (universal delivery) is not an important goal. It is. Rather, the point is that attention was re-directed to a problem that could be solved by the Internet and away from the more difficult issues of what was needed, what should be taught, and what would work for which students.

## Other dangers of education becoming nails that fit the hammer

There are several other educational issues that exhibit a pattern similar to the one just described, wherein the availability of ICT has turned attention away from a core goal and to a secondary goal. Consider first the role of job/employment training in public education. It is certainly an important part of education that students develop skills that they will need in order to find jobs and function as workers. With the development and integration of ICT, educators have come to believe that training in ICT is essential to prepare students for their future work-lives. Indeed, this goal of education has gained much more prominence; here is "a nail" for which the hammer can be used.

Many of the jobs of the future (perhaps the best jobs of the future) are likely to be in ICT-related industries or they are likely to require the use of ICT. Thus, if ICT is not accessible in all educational institutions, inequality in access to this kind of education will lead to inequality in access to (perhaps, the best) jobs in the future. Many educators recognize this and believe that students who are exposed to ICT at school (and at home) will be much bet-

ter prepared for the jobs of the future. Those who fail to learn about ICT will not be prepared; they will be at a disadvantage in looking for employment in the future. In this way, the availability of ICT skews the goals of education towards job and career preparation; job training becomes a prominent goal often to the neglect of more fundamental educational goals such as literacy. As with the goal of delivery, I do not want to argue that acquiring skills for employment (in an ICT based world) is not important; it is. Rather I want to note a diversion of attention and resources away from more fundamental goals.

Ironically, the ongoing development of ICT continues to move in the direction of more and more user-friendly technology. This means that it takes less and less education to work with ICT. Thus, many of the jobs of the future may not require a very sophisticated understanding of ICT.

Yet another shift that seems to take place in the negotiation between the capacities of ICT and the goals of education is a subtle shift towards understanding education as information management; that is, with ICT education is understood more and more to be learning how to manage information as opposed to creating, evaluating, and acquiring information. Information management involves accessing and manipulating information available in databases; it means searching for information on the Web, interacting with systems, cutting and pasting, and so on. To be sure, these are important skills in a world of ICT. We presume that there will continue to be enormous amounts of information available at our fingertips; thus, education comes to look like a matter of accessing and using this information.

The problem is not that this view of education is misguided; rather, the problem is that it shifts attention away from other goals of education. For example, because ICT provides individuals and organizations with so much information, what individuals need more than ever is abilities to select and discriminate among information and information sources. Students need to learn how information is created and how to think critically about and evaluate information. In other words, they need to understand the world behind ICT rather than simply being called upon to function in it. These skills, however, do not look like a nail that can be pounded with a hammer. That is, the skills and judgment involved in selecting and discriminating among information cannot be taught by ICT.

Finally, there are many aspects of education that can only be achieved (or best achieved) through face-to-face interaction; yet, the promise of distance education may lead us down the path of redefining the goals of education so that they can be achieved at a distance. In “On the Internet”, Hubert Dreyfus argues for the importance of the body in education. He gives an account of education as moving through progressive stages of accomplishment from those involving mastery of simple skills to later stages that increasingly involve synthesis and integration and a certain kind of attention and caring. The later stages of learning increasingly require the involvement of the body. Dreyfus concludes his analysis by claiming that “if our body goes, so does relevance, skill, reality, and meaning”. In short, he argues that those who laud the Internet as the means by which humans will transcend their bodies, do not understand that everything that has meaning and relevance for human beings is connected to our embodied nature.

Thus, while ICT and especially the Internet provide the infrastructure for distance education on a global scale, we have to be careful that those aspects of education that require the body, that is, face-to-face interaction are not lost or redefined so that they may be achieved at a distance. Goals that require face-to-face interaction will not look like nails in an environment where a powerful hammer is available. Thus, diligence will be required to ensure that ICT does not change education in ways that undermine its foundational goals.

## Conclusion

The introduction and permeation of ICT into educational systems and classrooms has great potential to transform education for the good, but it also has great dangers. In order for ICT to assist in education, there has to be a negotiation between the capacities of ICT (what ICT can and can’t do) and the goals and strategies of the educational endeavor. This negotiation process requires that educators think about what education aims to achieve and how best to achieve it; at the same time, the negotiation requires an understanding of how ICT works and what it is good at doing and what it isn’t good at doing. The two must then be matched; a fit must be negotiated. The negotiation/matching process creates a great opportunity for educators to think about what they are doing, to make explicit what they had been presuming, and then reaffirm or change the goals and values of education. This is a worthy undertaking in itself.

Nevertheless, there are dangers in this process of negotiation between ICT and education; the goals and values of education may be redefined and distorted in order to take advantage of what ICT has to offer. The danger is serious because educators are pressured to use ICT.

To be sure, ICT has a place in education, however, educators should be careful to keep ICT in an appropriate place and not let it distort the core goals of education. ICT should not unduly influence our understanding of the goals and values of education. We should avoid the danger of making education into nails so that the ICT hammer can be used.

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# THE ROLE OF SOCIAL AND ETHICAL STUDIES OF INFORMATION TECHNOLOGY IN THE UNIVERSITY CURRICULUM

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In this paper, I will assess the role of education regarding the social and ethical aspects of information technology in the university curriculum. I will begin in section 1 by outlining a field of study which I call social and humanistic studies of computing (SHC) and contrast this with applied studies of societal aspects of computing (ASC). In section 2, I will argue for the importance of both SHC and ASC in university curricula and relate their roles to academic and professional functions of university education. In section 3, I will describe how courses in SHC and ASC may be taught in practice, illustrating this with a description of the minor ICT and Society, which I have helped to develop at my university, and with a description of a course in Computers and Society. In section 4, I will assess the relation of computer ethics to SHC and ASC and its role in the university curriculum. I will outline educational goals for computer ethics education and provide a brief description of a course in computer ethics that meets these goals. In the concluding section, finally, I will briefly consider how my remarks on social and ethical studies of computing would translate to a different area: that of secondary education.

## 1. Social and humanistic studies of computing

Computer ethics as a field of study is part of a wider field of study, which may be called *social and humanistic studies of computing* (SHC). SHC are studied by scholars in the humanities and social sciences of computers and their roles in society. I define SHC as theoretical or nonapplied studies of the way in which various forms of information technology shape, and are themselves shaped by aspects of their *social context.* By the social context of computer systems, I mean any aspect of individuals, collectives or social systems that constitutes part of the environment within which one or more computer systems are used. Hence, a study of the psychological effects of regular Internet use is a study in SHC. So is a study of the influence of computer networks on the structure of large organizations, a study of cultural practices of users of mobile computing devices, a study of cultural images of computers throughout history, or a study of the role of information technology in globalization. Studies in SHC hence consider any sort of way in which information and communication technologies (ICTs) relate to their larger context of use. Studies in SHC are *theoretical*, as opposed to *applied.* Their primary aim is not to change practices or develop policies. It is only to understand.

Over the past twenty or so years, the amount of research within the scope of SHC, as defined here, has increased dramatically. Still, SHC is not often seen as a coherent field of study. There has been some effort by social scientists, however, to turn social studies of computing into a field, for example by Rob Kling, editor of the journal *The Information Society*, who has been promoting the label *'social informatics'* to designate social studies of computing. But on most counts, the coherence within the field of SHC is limited. Nevertheless, there are nowadays specialized journals that help give it coherence, such as *The Information Society, Computers and Society, New Media and Society, Information Technology & People*, and *Information, Communication and Society*, as well as specialized societies and conference series.

Next to the emergence of SHC, there has been an emergence of various kinds of *applied* research on societal aspects of computing. Here, there is even less coherence between the various approaches that exist. Therefore, when I speak of *applied studies of societal aspects of computing* (ASC), I do not refer to a field but just an existing set of studies and approaches that are often unrelated to each other. Research in ASC has in common that it is not primarily concerned with a theoretical understanding of the social context of computer systems, although such theoretical knowledge usually plays a useful role in applied research. Instead, research in ASC is concerned with developing effective tools for professionals in various fields for coping with various societal aspects of computer systems. Such studies include applied studies on computer law, computer-assisted education, management and computing, and e-commerce, amongst others. SHC and ASC are hence complementary in the way they approach societal or nontechnical aspects of ICTs: the first is concerned with gaining at theoretical understanding, the second with developing practical know-how.

## 2. SHC and ASC in the university curriculum

Let me now turn to the question of the role that both SHC and ASC should have in the university curriculum. I take university education to have both an *academic* and a *professional* function. In some study programs, the academic function is emphasized. These are programs that lead to an academic degree. They are aimed at equipping students with theoretical knowledge within a field and with research skills for developing more theoretical knowledge in that field. Other university study programs lead to a professional degree. In such programs, the educational emphasis is on professional knowledge and skills, and the research skills that are taught relate to research aimed at developing *applied* forms of knowledge, or on *applying* knowledge in specific contexts.

Now, it is certainly not the case that the academic and professional functions of university education are mutually exclusive. Academic study programs always also have a professional role, in that they train students to become members of a certain profession. This is the profession of an academic scientist, equipped with research skills for furthering a specialized field. Conversely, professional degree programs at the university level tend to have an academic component, in that they emphasize academic, theoretical knowledge and skills. Theoretical knowledge acquired in a professional university program is considered important as a theoretical background for more applied tasks. For instance, a mechanical engineer should have a basic training in Newtonian mechanics because this theoretical knowledge is relevant to the applied knowledge and skills that are the primary focus of a mechanical engineering program.

Theoretical knowledge is not just important as a preliminary to mastering applied knowledge and skills, however. It is frequently also considered important for the more general academic outlook that is the landmark of university education. This general academic outlook is realized through courses in *general education*, some of which emphasize *cultural literacy and societal knowledge*, others of which emphasize *general cognitive and professional skills.* Someone with a university degree, whether academic or professional, is not just expected to excel in his or her field, but also to adhere to certain minimum standards of cultural literacy, and to have good general cognitive skills. That is, he or she is supposed to have an *above average understanding of society, culture and history, and to have above average cognitive skills in analysis and synthesis.*

To summarize, some university programs focus on academic education, emphasizing theoretical knowledge and research skills, whereas others emphasize nonacademic professional knowledge and skills. Yet, every university program promotes a general academic outlook by offering courses in general education that are outside one's specialty. Given this characterization of university education, there are at least two reasons why it is advisable to make education in SHC and ASC a *required* part of today's university curriculum.

First of all, there are good reasons to suppose that the general education component in a university program should pay attention to issues in SHC. This is because, I claim, such a program would give a shallow and outdated picture of society if it left out an analysis of the great changes that information technology is effecting in virtually every sector of society. The economy, government, education, health care, religion, scientific research, the media, entertainment, the arts, organizations, the workplace, interpersonal relations, and many other core institutions of society are being transformed through information and communication technologies. If one were living at the time that the industrial revolution would take place, one would not want a general education program to focus on preindustrial society. Instead, one would want it to pay attention to industrialization processes and the changes these are affecting. Likewise, one would expect a contemporary general education program to pay attention to the current information revolution, including the roles and effects of information technologies.

Education in SHC may not just be desirable within an education program because it is an important part of a general education component. It may also provide part of the background or context within which a good professional is able to situate his or her work. This role of SHC education can perhaps be illustrated best by looking at computer science curricula. Computer science curricula focus on knowledge and skills by which computer professional may design, operate or manage certain types of technologically complex systems. Much of the knowledge this requires is technological: it pertains to the rules according, which these systems operate. However, computer systems also have to make a good fit with their social context. Users have to be able to use them well, organizations have to benefit from them, and sometimes society as a whole is supposed to benefit as well. A good fit between a computer system and its social context is not the mere result of it executing certain input-output functions without error. The technology also has to work in harmony with its social context. Therefore, a broader understanding of how computer systems impact and fit in with various aspects of their social context is, if not necessary, then at least highly advisable if one is to be a good computer scientist. And this means that education in SHC is defensible as a required component in computer science curricula.

Second, within the professional component of a university program, there is a clear need for specialized courses dealing with the role of information technology within someone's specific profession. That is, there is a special need for courses in ASC. Nowadays, there are few professions left in which information technology does not play an important role. Obviously, nearly every professional will be using information technologies as an *end-user*. But this not the role of information technology in their profession I am referring to. It is not clear that special courses in ASC are required to be a better end-user of information technology. Instead, what are required are just courses that teach one how to use the technology, and these are not courses in ASC because they do not normally focus on contextual aspects of information technology.

However, next to end-users, many professionals are also *decision-makers* regarding information technology. That is, in the course of their professional duties, they may be deciding that certain computer systems will be used, purchased or implemented, they may be deciding by whom they will be used and what they will be used for, and they may shape or influence various policies regarding the development, acquisition and use of information technologies. Because, increasingly, professionals have to make such *IT-related choices*, and because of the great impact such choices may have because of the revolutionary transformative power of information technology, it is increasingly important to include relevant education components on ASC in professional curricula. For example, in a policy program, it would nowadays be advisable to have a course on policy and information technology, because of the likelihood that professionals in this field will be making policy choices in which information technologies play key roles. Likewise, in an education studies program, it would be advisable to have education on computers in education, because of the profound impact that computers are having on education.

I conclude that because of the general education requirement in university curricula, and in some cases also because of the professional function of curricula (as in the case of computer science), education in SHC is highly advisable. Specifically, it would in my opinion be advisable to have a required course on *Computers and Society* across the university curriculum. Moreover, an equally good case can be made that professional programs should contain at least one relevant course in ASC. This course should focus on the role of information technology within that specific professional field and should convey professional knowledge and skills that enable intelligent professional choices regarding the role of information technology within that field.

For some programs, one course in SHC and one course in ASC may not be enough. It certainly would not be enough for programs that train one to be a computer professional. Specifically, I would propose that a computer science program would devote at least 10% of its professional component on SHC and ASC. This means that not more than 90% of the professional component should be devoted to the technical aspects of computer systems, and at least 10% should consider the fit between computer systems and their social context.

## 3. Teaching SHC and ASC

My university, the University of Twente, grants professional degrees in engineering and applied social science. There are five-year Master's programs in various engineering fields, such as electrical engineering, computer science, and design engineering, and four-year Master's programs in various applied social science fields, such as education, policy and business administration. Students follow a three-year bachelor program, which includes a half-year minor program in a field different from their area of specialization, after which they follow a one- or two-year master program. Students are free to choose a minor program to their liking and they also have some amount of choice regarding the master programs they may follow immediately after completing a specific bachelor program.

At my university, I have taken the initiative to start a new interdisciplinary *minor program* called *ICT and Society*. This minor is the equivalent of half-a-year of university education, or 820 hours, and is stretched over the course of an entire academic year. In the academic year in which they take the minor, students hence have 50% time to work on the minor and 50% time to take courses in their own field. The minor *ICT and Society* is not currently a required minor for any degree program at my university, but we hope and expect it will be a recommended minor for several programs.

The aim of the minor *ICT and Society* is twofold. The primary aim is to acquaint students with basic issues in SHC. A secondary aim is to teach general professional skills for decision-making in relation to computer systems. This is a general ASC component of the major. Students have a degree of freedom to tailor the ASC component to their own professional area. In this way, the minor *ICT and Society* equips students with the basic understanding and skills to provide them with general education in this vital area and to deal with the social context of computing in their prospective careers.

To further these two aims, the *ICT and Society* minor is set up to have the following structure. In the first trimester of the academic year, students take three introductory courses. The first is a basic course on the technical aspects of computer systems. This course aims to familiarize students with basic properties of computer systems and the ways they are used in society. Computer science students participating in the minor do not have to take this course, and have the option of taking another course relevant to their professional interests, such as a course in computer law (which is not a required course in their own professional curriculum). The second course, taught by me, is a basic course on computers and society. It treats social aspects of computing as one would expect in a course dealing with basic SHC issues. The third course is a course on the role of computer systems in organizations (both governmental and commercial). This topic was considered by us to be an important SHC topic for the students at our university, because most will be assuming important roles in commercial or governmental organizations. This is why we decided to devote a special course to it.

In the second trimester, students take applied courses that can be characterized as courses in ASC. One course provides students with tools to do technology assessment of information technologies. This course aims to enable students to do general assessments of the societal or organizational impacts of new computer systems. A second course focuses on two specific topics: e-commerce and e-government. It studies models and theories within these two areas and teaches about applications and application methodologies in both areas. A third course focuses on virtual communities, and looks at methods for investigating such communities, as well as at assessing the conditions under which such communities function well. In the third trimester, finally, students take up a small research project within one or more of the aforementioned areas. They may do so individually or (preferably) in small groups in which people from different disciplines work together.

For many students, however, a half-year program on *ICT and Society* may be too much of a good thing. I would not advise it to become a required minor for any program, with a possible exception of the computer science curriculum. In the previous section, though, I argued for a *required* course *Computers and Society* across the university curriculum. I will now consider what such a course may look like. The aim of a course in computers and society would be to acquaint students with basic issues in SHC, that is, it would teach about the role of information technology in various sectors of society and regarding various aspects their social context. A course on *ICT and Society* would leave students with a basic understanding of how ICT is transforming social institutions and practices. I now present a possible list of topics for a course on *ICT and Society*. Most courses would make a selection from this list:

1. *ICT in contemporary society*. A qualitative and quantitative assessment of the role of ICT in current society. A quick survey of the role of ICT and in various sectors of society (e.g., regarding work, the business world, medicine, education, government, the media, and everyday life), and related issues and problems. Key statistics on the users and uses of ICT.
2. *The information revolution and the information society*. A broad macro-perspective on the way in which ICT has changed the economy and social institutions in recent history. With a brief introduction to some theoretical perspectives, e.g., Beniger's theory of the Control Revolution (Beniger, 1986) or Castells' trilogy on the information age (Castells, 2000).
3. *Social history of ICT and its role in society*. A historical survey of the birth and spread of the digital computer, and social and cultural changes resulting from it. Attention is paid to changing functions of the computer in the workplace, in the economy, and in organizations, to past social struggle, and to images of and discourses on ICT.
4. *ICT and the economy*. An assessment of the role of ICT in the economy and of the difference between Fordist and postfordist economies. A consideration of the role of producers and consumers in this process.
5. *ICT and politics*. An assessment of the way in which ICT is transforming politics, both regarding the relation of citizens to the state, the relation of corporations to the state and its citizens, and the hierarchical structure of organizations. A treatment of specific political issues like privacy, freedom, democracy, and social justice.
6. *ICT and law*. An assessment of the way in which ICT is transforming law. Problems and issues like informational freedom, privacy, and intellectual property.
7. *ICT and social structure*. An assessment of the way in which social structures, roles, relationships and behaviors are changing because of ICT. Topics may include the 'digital divide' between 'information-haves and have-nots', changing roles of various social groups (e.g., women, the elderly), the changing structure of social relationships, and changes in communication.
8. *ICT and culture*. An assessment of the way in which cultural beliefs, practices and experiences are changing because of ICT. This may include an assessment of the changing role of media, of the changing role of communication and information, changes in lifestyles, and the emergence of new cultural forms.
9. *ICT and human psychology*. An assessment of psychological changes correlated with the use of ICT. Mental processing of information with new media; changes in personality and social psychology; changes in conceptions of reality, time and space.

10. *ICT and the future*. Current expectations and scenarios for future technologies and trends in the information society.

There are nowadays various good textbooks that could be used in such a course. A very good textbook is Richard S. Rosenberg's *The Social Impact of Computers*. Also excellent is *The Network Society*, written by my University of Twente colleague Jan van Dijk. Other books are the reader *Computers in Society* edited by Kathryn Schellenberg, Rob Kling's *Computerization and Controversy: Value Conflicts and Social Choices*, and Paul Winter's *Computers and Society*.

I currently teach two rather broad courses on computers and society. The course that I offer in the context of the minor ICT and Society is called *Humans and Information Technology*. It is not currently a required course for any degree program. The other course is called *The Information Society* and it is a required course for first-year computer science students. In both these courses I teach many of the topics that can be found in he above list. In this way, I hope to acquaint students with what I see as the main topics in *Social and Humanistic Studies of Computing*.

## 4. Teaching computer ethics

For computer science students, or for other students specializing to become a computer professional of some sort (e.g., students specializing in library science or computer-assisted education) it would be highly advisable to have, in addition to a required *Computers and Society* course, a required course in *computer ethics*. To understand the role of computer ethics in the university curriculum, an understanding is needed of the kind of knowledge and skills that are the hallmark of it. I will try to arrive at such an understanding by analyzing the goals of computer ethics education and its relation to the goals of education in SHC and ASC.

To start with the second issue, is computer ethics a form of social and humanistic studies of computing, aimed at a *theoretical* understanding of ethical aspects of computing, or is it rather a form of *applied* research on societal aspects of computing, aimed at developing practical professional tools? If one would take as one's point of departure Jim Moor's influential conception of computer ethics, one would have to conclude it is both. Moor claims: "On my view, computer ethics is the analysis of the nature and social impact of computer technology and the corresponding formulation and justification of policies for the ethical use of such technology." (p. 266) Quite clearly, the analysis Moor refers to in the first part of his statement is a central concern of SHC, whereas the formulation and justification of policies referred to in the second part clearly belongs to ASC. Thus we have more fundamental studies in computer ethics, that belong to SHC and that are aimed at an understanding of ethical issues relating to computers and their uses, and we have more applied studies in computer ethics, that belong to ASC and that are aimed at arriving at specific policies.

In teaching a course in computer ethics, one may of course emphasize either the more fundamental or the more applied dimension of computer ethics. In a professional program for computer science students, one may want to opt for a course in computer ethics that is mostly applied, and that focuses on professional roles of computer scientists. In program in policy studies, or in law, or in science, technology and society, one would likely emphasize more fundamental issues in computer ethics. Normally, however, a course in computer ethics would integrate both dimensions. Regarding privacy, for example, it would both teach general moral theory on privacy, specific moral analyses of informational privacy, the various ways in which privacy considerations come up in contemporary computer systems and their uses, existing privacy law and policies, and professional responsibilities for protecting privacy.

An ideal course in computer ethics, then, should have both the goal of promoting an understanding of major ethical issues in computing, as well as of providing aspiring professionals with tools for giving content to their own professional responsibility in dealing with computer systems. In constructing such a course, one should begin with a selection of moral issues regarding computers that can be considered to be the most pressing in contemporary society. The will include many of well-known issues in the computer ethics literature. My own selection would certainly include issues of privacy, autonomy, justice (with special emphasis on the problem of the so-called 'digital divide'), democracy, (informational) freedom, and quality of life. Second, one should opt for a 'rich' presentation of these issues, in which one treats both their moral worth and significance; the way they come up in current computing controversies (include here a consideration of one or more exemplary cases); past policies and laws that have been devised to deal with them; professional responsibilities regarding the issue and ways in which professionals may deal with them.

The way in which the professional component of a computer ethics course is set up will depend strongly on the nature of the professional program within which the course is situated. Obviously, in a law program, a course in computer ethics would focus on ethical issues in computer law, and how to deal with them professionally. In a program in education studies, a course in computer ethics would focus on ethical issues in designing education programs involving computers in using computers in the classroom. In a program in computer science, there should be special emphasis on ethical issues in the design of computer systems and software (cf. Friedman and Nissenbaum, 1997; Brey, 1998, 2000), as well as in their maintenance and their operation. In all cases, the emphasis should not just be on the ethical issues that come up in these professions, but also on the professional responsibility to deal with them, and the practical procedures one may follow in dealing with them.

## Conclusion

I have argued in favor of a required course in university curricula on *Computers and Society*, that acquaints students with basic issues regarding the role of ICT in contemporary society, and a required course in ASC in professional programs, that focuses on the role of information technology within the relevant professional field and that conveys professional knowledge and skills that enable intelligent choices regarding the role of information technology within that field. I have also argued for computer ethics as a required course in professional programs that prepare students to become computer professionals. These courses should both acquaint students with major ethical issues in computing, and provide them with practical tools for giving content to their own professional responsibility in relation to computer systems.

Let me close by focusing on the role of education on social and ethical aspects of IT in education programs *prior* to university, specifically in *secondary education*. In secondary education, there is less of an expectation that students will have a serious decision-making responsibility regarding information technology in their future profession. Hence, education in and SHC and ASC at the secondary school level may not be justified by reference to the future profession of secondary education students. The argument for attention to SHC in general education, however, certainly applies to secondary education as well. Therefore, acquainting students with the role of ICT in society should be considered a legitimate and important topic in secondary education.

Next to this, I think there are also good reasons why an attention to ethical issues regarding ICT has a place in secondary education. Secondary education is the learning phase at which ethics can first be taught. Moral issues like abortion, the death penalty, and genetic engineering are great issues to explore in secondary school, not through an emphasis on moral theory, but though an emphasis on cases, and moral learning through a joint discussion of such cases. Their own morality in their everyday life should certainly also be a topic. In relation to this, it would be very useful to discuss with students the ethical issues that come up for *users* of information technology, for example in using the Internet, and to discuss also their own moral stance on these issues, as (potential) users of the technology.

Such a discussion is particularly important because information technology is not yet a technology that has reached "closure" (Pinch & Bijker, 1997). That is, the interpretations, rules, policies and patterns of behavior surrounding information technology are not yet as fixed as they are around many other technologies. The world of cyberspace is not yet an orderly society. It is still a bit the Wild West, and as this vast new space is being colonized, and made into an orderly society, everyone should be asking the question of what kind of society we want it to be. We as adults should not just ask this question to ourselves and to each other, but also to the new generation that will inhabit it.

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# ACADEMIC CULTURE AND BUSINESS ETHICS: EFFECTS ON EDUCATIONAL ICTs

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In this paper I will discuss a range of issues involving educational Information and Communications Technologies (ICTs): studying them from specific perspectives, and examining particular aspects of associated academic and business culture which may generate ethical issues and difficulties.

A brief introduction first identifies three constituent groups of particular importance to informed discussion of Educational ICTs. The paper then looks in more depth at each of these groups in turn, before moving on to consider related ethical dimensions. Particular reference is naturally given to recognition of possible ethical issues, and of practical responses to them.

The introduction of ICTs is now globally viewed as appropriate, and is supported by governments world wide. A typical view was recently expressed by Trevor Mallard, New Zealand Minister of Education:

> "ICT builds and encourages co-operation between schools, businesses, and tertiary education providers. It can also link schools and families more effectively and can help to overcome problems of rural and international isolation. It can support better and more efficient administrative systems that allow school professionals to concentrate on what they do best – teaching!"[1]

However, while acknowledging their benefits, it is important to start with the realization that ICT installations are not necessarily value neutral. Introduction and use of such technologies is likely to involve an inevitable assumption of new ways of thinking, together with reassessment of previously unconsidered attitudes. For this reason, ICT introduction into the established culture of an educational establishment is liable to involve more than the simple provision of new equipment, even if that physical equipment may be more visible than any unspoken requirement for new ways of thinking.

It is also true that, quite apart from new ethical problems related directly to ICT use, the transfer of cultures and opinions from external players, such as educational academics or professional computer scientists, has the potential to bring associated ethical dissonance. This can mean that what may have generally been considered appropriate behavior – within the restricted area of an educational establishment with limited external links – could be disturbed by the introduction of new participants, participants who are naturally without previously familiar shared perspectives and experience. Ethical dissonance within an educational establishment may therefore describe the differing perceptions of individuals of what should constitute appropriate behavior, based upon very different previous experience, training and backgrounds. ICT use can therefore bring, as well as new ethical difficulties, new versions of familiar problems.

If we begin to examine such potential difficulties, who may be identified as those individuals most concerned? There are three principal groups. Probably the most widely distributed discussion of the application of ICTs to education comes from the understandably focused perceptions of educators themselves. A second grouping associates the broader based – but nevertheless central – work of individuals and companies responsible for the commercial implementation and provision of ICTs and related services. A third, and perhaps most often overlooked, sphere is just as relevant – consideration of the essential role played in ICT development by educational administrators. Such administrators have an often thankless task, in balancing the infinitely expansible demands for ever newer and more powerful educational technologies with the frequently depressing realities of restricted funding and limited educational budgets.

We may therefore usefully approach a discussion of ethical problems related to academic and business cultural effects on educational ICTs from three distinct routes. These are the perspective of educators, consideration of those responsible for commercial applications and development, and, finally, through consideration of the specific viewpoint of educational administrators.

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[1] http://www.minedu.govt.nz/index.cfm?layout=document&documented =5923&data=l

## Educators

In most developed societies today, the work of educators in virtually every field may be supported and enhanced by the use of modern computer technologies.

Given suitable hardware at classroom level, the availability of specialized applications and associated software has the potential to enrich practically every taught subject. As the power of computers has increased and their availability improved, it is becoming viable to consider regularly incorporating computers into the actual practice of teaching – although, of course, wide disparities in available equipment may still restrict widespread incorporation. Development of suitable applications for computer-assisted teaching is accelerating, despite the inevitable problems involved in application development and promotion – some of which are discussed below. Most importantly, it is now possible to share resources within an educational establishment, through the use of a local network, or Intranet. By means of such an Intranet a browser on a student's computer may access local materials which have been centrally developed and stored, rather than being printed and duplicated, or even taken to classrooms on CD or floppy disk. The advantages offered by local ICTs are obvious.

Of course, further onward connection to the Internet – specifically, to what is now generally known as the World Wide Web (WWW) – opens the floodgates of available material. While bandwidth and speed of connection admittedly remain an issue, connection to the Internet potentially allows both students and teachers access to a huge range of materials, much quite unreachable by conventional means. Were it in paper form, such material would be far beyond the reach of even the most generous of local education budgets. Even for an educational centre, which did not consider itself under-resourced, the opportunity to access without charge such a huge repository of information would be tempting; to all others, it is surely irresistible.

In simple terms, therefore, those responsible for classroom teaching ICTs may be considered as divisible into three principal areas. Local applications; local resources (potentially also networked locally though an Intranet); both supported by the wider linking and networking of external, WWW based resources. All three of these areas involve the potential for serious ethical issues to arise; and by no means all such issues are immediately obvious.

## The commercial context

Normally, when external assistance is needed for the development of applications and hardware, it is to be expected that appropriate resources will be developed and offered by business, for profit. The ICT requirements of educators for hardware, software, and services are no different; companies will naturally identify and move to meet such needs. This is both understandable, and fortunate; for example, it is normally impossible for individual educational establishments to have sufficient available resources to provide the time, money and equipment needed for adequate research and development. Once effective ICTs are installed and working, however, they may be similarly impracticable to identify and sustain the skills and expertise necessary to develop and maintain a successful computer network locally. Unless an educational establishment is a large one, involvement of external systems support, from professionals possessing appropriate knowledge and skills, will almost certainly prove to be both cheaper and more efficient, even if this support is only part-time. It is therefore normal for at least the practical work involved in installation and maintenance of an educational computer network to be carried out by external computer specialists, with additional potential for ongoing support, too.

For similar reasons, much educational software is also produced by external developers, who are able to share the sometimes substantial development costs by selling a similar product to many educators.

While there are clearly considerable advantages in the employment of specialist professional services in this way, there is also a considerable potential for educationally relevant ethical issues to fall between the two stools – of educational demand and commercial pressures – with a real risk of their being consequently overlooked.

What, if, though, external support is unavailable – or, more probably, unaffordable? This may not be an unalloyed advantage. While the absence of specialist ICT support services might well prevent scarce funds being paid to external contractors, it may itself bring unexpected problems. It is possible, for example, that a hard-pressed educator, attempting to maintain local ICTs without professional help, may be unaware of ICT-related ethical issues, although such concerns may probably be all too familiar to a specialist in the field.

## Educational administrators

Finally, the frequently obscured and misunderstood role of the educational administrator needs to be considered. In order to be clear what is meant here by what may well be sometimes an amorphous role, for the purposes of this paper *educational administrator* is defined as 'an individual or team with overall responsibility for an educational budget'; the administrator is consequently the foundation of local ICTs financial authority. While both an educator and a commercial developer may understandably be strongly in favor of heavy spending on ICTs, it is the thankless role of educational administrators to enforce an agreed budget, and, additionally, to take a longer-term perspective when considering the purchase of equipment and services. To effectively carry out such a role is to spend a working life juggling resources and priorities, in the certain knowledge that – whatever decisions are reached – some people must inevitably be disappointed.

While it is clearly essential to keep within agreed budgets, as the field of ICT development becomes increasingly specialized, it is also necessary to appreciate that cost, while important, is not the only significant consideration. Given the continual stresses and demands made upon educational administrators, it is certainly possible that financial pressures in particular could result in the ethical issues of ICT-related decisions not always being given full consideration.

Administrators, too, are in the front line when external pressures are applied. Government in most countries, for example, is inclined to take a pro-active stance in ICTs, setting targets and insisting upon particular implementations – without always providing all the necessary resources.

Such pressures may come from local or national government. In the UK, for instance, the Government set specific ICT targets to be met by primary and secondary schools. The London Borough of Lambeth subsequently issued 'Notes for Schools' based upon national Government targets:

- A computer: pupil ratio of at least 1:11 in each primary school and 1:7 in each secondary school by August 2002 and progress towards the published target for 2004.
- A connection to the Internet in every school, with all secondary schools connected at broadband level (at least 2 Mbs) and as many primary schools as funding will permit.
- Secure, networked access to management information systems provided to relevant school staff by August 2003.[2]

Such plans are by no means unique to the UK; for example, we have already considered the approach of the New Zealand government. It is clear, therefore, that the financial pressure on educational administrators may be felt from more than one direction.

Having briefly described the background to the establishment of educational ICTs from three perspectives, I will now look at specific areas where ethical problems may arise; this part of the paper is deliberately designed to take a practical, rather than theoretical, approach. While it is certainly true there are clear issues which may be identified from study and analysis of existing ICTs, it is also true that individual installations and individual establishments can potentially produce individual problems – so this can by no means be a comprehensive list.

## ICT–related ethical issues involving educators

In order to support and maintain networked computer systems, it is obviously necessary to give the maintainer special privileges, over and above those open to 'normal' users of that system. For this reason, a maintainer is often referred to as a *superuser*. The unique privileges available to a superuser typically allow the creation of new accounts, control of normally hidden data files, logs of activities, and so on, together with access to all material belonging to or created by any user. When an ICT is installed, there are two options open for 'setting up' the system; it can – very unusually – be left 'open'; or selected individuals are established as superusers. It will be clear that the selection of suitable people to carry the responsibility of system maintenance is of considerable importance to the integrity of the entire system; and yet it is by no means unknown within educational establishments for the role to be allocated without too much consideration of its wider implications.

[2] National Grid for Learning (NGfL) London Borough of Lambeth 2002-2003 Notes for Schools - http://www.lambeth.futureclass.net/Resources/getFile.cfm?filename=NGfL%205%20Notes%20for%20Schools.pdf&download=1

## Control of the ICTs may potentially raise serious ethical issues

As an illustration, a large comprehensive school in the West Midlands of the UK installed an ICT which, as well as much else, allowed internal and external email for staff and (some) students. This facility proved very popular. However, the member of staff given responsibility for maintaining the system found it easy to read and monitor email, and did so unnoticed for some time. It was later found that they had viewed sensitive mail – including mail between senior teaching staff – and had secretly stored copies of it.

Internal mail in a school might be scribbled on odd sheets of folded paper, kept in open staff room pigeonholes, may consequently be accepted as widely accessible. Electronic mail, in contrast, is perceived very differently. Most people who use electronic mail consider its contents restricted to sender and recipient, not appreciating that their correspondence is potentially open to anyone with electronic control over any of the intervening stages between writer and addressee.

There are other technical points which have the potential to cause ethical problems for educators. A typical example lies in access to the system. While access is normally controlled by passwords, a decision needs to be made on who should allocate passwords, and on what basis; and, of course, whether – and how often – passwords should change. Local approaches to password use can vary considerably; in one establishment 'layered' passwords were in use, designed to distinguish between staff and students, allowing greater privileges and access to members of staff. However, what tended to happen in practice was that, once logged in, members of staff often forgot to log out, leaving that machine potentially open to anyone – staff, student or visitor. Even more worryingly, in another ICT system, monitors attached to shared computers used by some staff members were found to have attached yellow Post-It notes containing passwords.

Of course, there are also potential parallels with those ethical problems experienced with business computer systems. Inappropriate computer use is just one example; while I am not aware of a private commercial project being secretively run from a school computer, this has certainly happened within a business setting, and, without clear controls and oversight, there is little to prevent it.

Effective oversight and control of student computer use must clearly be a central issue for educators. However, much, if not all, of the concern expressed over the risks of Internet use within schools to date has focused on access to pornography. For this reason I do not intend to address that issue here. There are, however, other issues concerning inappropriate access to material from the Internet which are perhaps as worrying, and which have received rather less publicity.

For example, it is easily possible to obtain online instructions for constructing effective bombs, using only household ingredients. It is possible to view extreme racist propaganda, to find instructions for picking locks, forging documents, faking credit cards, and much else. Concentration on ways to block student access to pornography could distract from the need for a wider oversight of equally inappropriate material!

One approach popular with schools, that of using a special web browser filter to block named web sites, is likely to prove ineffective in the longer term. New sites of course spring up daily; and it is worryingly also possible for sites viewed by the filter designers as politically incorrect (such as sites dealing with women's issues) to be invisibly included on a 'blocked' list, and banned as well.

The responsibility of educators for the responsible use of ICTs may be accepted, but the full range of their consequent responsibilities are far from clear. We have so far considered ICT connection to a global network as allowing access to a huge range of material, capable of greatly enriching the teaching and learning experience. However, such a connection is, of course, potentially a two-way one. Students can be given the ability to broadcast their views to an international audience, through direct communication, or development of their own web sites. Responsibility for appropriate use of such a powerful communication medium certainly cannot be restricted to specialist educators. What role, for instance, might be appropriate for parents? Full debate and discussion should surely precede decisions over ensuring appropriate use of such a capability.

The ability to make individual views and opinions available to a potentially global audience is potentially open to every ICT network connected to the Internet. Such an ability is, of course, unique in human history – and today's educators are in the front line.

## ICT–related ethical issues involving external commercial partners

In discussing those ethical aspects of concern to managers of ICTs having involvement with commercial partners, it is necessary to consider two rather different perspectives. The first concerns ICT related software – meaning in this context the provision and supply of applications and data by a commercial organization. The second, and potentially less obvious, concerns the provision of technical services and equipment, together with the ongoing oversight of ICT systems.

Both these areas involve individuals who are not normally members of the educational team, and both may therefore result in the importing of perceptions and views which may create what was described earlier as 'ethical dissonance'.

While many developers of educational software may be former educators, today's developers are unlikely to be carrying out development as a part-time activity while still teaching. Although their knowledge and experience of education may therefore be deep, they cannot have the current day-to-day knowledge possessed by active educators. It is true, too, that the needs and objectives of an educational software developer are potentially very different from those of an educator. An understandable concern with selling products and establishing profits must bring at best a different perspective to the problem of generating appropriate educational software.

Consideration of ethics is relevant here, because the underlying focus of educational software may not be immediately clear. For example, there is a well-established and long-standing pattern of assessment of those books intended for school or school library; but, when considering the purchase of school software, a similar pattern may be far from well established. Obvious potential problems with software can range from the unthinking incorporation of inappropriate names or gender models, to the incorporation of violent imagery, on the grounds that it will appeal to boys; after all, ensuring user satisfaction is one way to effectively maximize sales. To an international audience, the unthinking assumption that the educational world speaks American is perhaps also unfortunate.

Less obvious problems relate to the technical underpinning of software. For instance, applications which are designed to run only on particular computers, running specific systems software; applications which require the purchase of additional equipment (such as sound cards and speakers) to use all their features are not uncommon. Applications which have built in obsolescence, breaking when system software is updated; applications which insist on proprietary formats for data storage, and applications which are so copy protected that their use is seriously handicapped are all examples of the commercial context adversely influencing educational software.

Technical support is a related but different area, deserving particular attention. Chronologically, we first have a situation where the actual provision of new ICTs is contracted to a supplier. As with other equipment, what the supplier actually installs will obviously reflect the specification they have been given (and which has been financially approved by the educational administrator – discussed below). However, educational ICTs are not just another business computer system. There are specialist needs and protections which are best built in from the beginning, rather than added after the need for them becomes painfully obvious.

Generally, the specification of hardware and software is likely to be driven by a need to reduce costs to the lowest possible level. Computers are still relatively expensive, networks are not cheap, and technical support is both hard to find, and well paid. Given the practical necessity of balancing expensive resources within a limited budget, justification for a preliminary in depth analysis may be hard.

However, appropriate systems analysis can reveal potentially serious problems in the installation of an ICT – problems which could result in major difficulties in using the system later. For example, one establishment underestimated the need for terminals in classrooms. As a result, the physical networking which was initially installed proved incapable of carrying the traffic. Another example left an establishment with 25 computers simultaneously attempting to make an Internet connection through a single 56-baud modem.

More seriously, monitoring of web traffic may be effectively controlled through a web 'proxy',[3] and it is clearly sensible for this to be considered at the same time as the rest of an ICT.

[3] National Grid for Learning (NGfL) London Borough of Lambeth 2002-2003 Notes for Schools - http://www.lambeth.futureclass.net/Resources/getFile.cfm?filename=NGfL%205%20Notes%20for%20Schools.pdf&download=1

Overall, therefore, the initial stages of ICT installation need careful and informed oversight. A business approach is likely to be familiar with the installing engineers, but the needs of an educational ICT are likely to be different in several important respect. We have discussed the technical underpinning, but the actual use of computers will be very different from that of a normal office. For instance, one user to a PC is the business norm, but few schools are able to offer anything approaching that ideal. Use of ongoing Internet connections will probably be staggered for business use, while a room full of terminals are likely to be used at the same time in a school – and so on.

The ongoing technical support needed by an ICT may also be an issue. As we have seen, while a *superuser* plays an essential part in keeping the ICT running, in order to do their job properly they have to be allowed awesome powers over the system. If the responsible individual has a technical, rather than educational, background, and comes from outside the educational field, it is clear that they cannot automatically be relied upon to accurately reflect a particular local philosophy. It is therefore crucial that an ethical stance is worked out in advance, and that the expectations of all concerned with the use and support of ICTs are made quite clear *in advance* of any problems which may develop, and of anticipated reactions to them.

## ICT–related ethical issues involving educational administrators

Underpinning all ICT development lies the need for actual provision of equipment and practical resources, whether these be computer equipment, computer software, or perhaps additional support staff. Unfortunately, as the work of an educational administrator is frequently invisible to most staff, the vital role played by an administrator in the establishment and maintenance of ICT systems may well be overlooked or ignored. In considering the effective and ethical use of educational ICT systems, therefore, it is important to address specific points where educational administrator involvement is of particular importance, and especially where their influences are likely to play a major part in the successful installation and on-going support of a networked educational computer system.

The initial questions concerning any new system are likely to be those of cost and appropriateness. Issues which are likely to be most important from the perspective of an educator are probably equipment, compatibility, and power, together with the range of 'extras', such as speakers and printers, and the availability of suitable software. Understandably, an educator is concerned with the beneficial effects of new equipment, rather than, for example, the development of a detailed specification, or the limitations of a tendering process.

From the perspective of an educational administrator the purchase of new equipment is not unusual, and it is likely that procedures are already in place to ensure that the choice of equipment and the process by which it is ordered are appropriate, and cost effective.

However, when considering the particular needs of ICTs, there are basic aspects of networked computer systems which may well fall outside normal procedures. An important instance is the need for appropriate oversight of system use; especially as the system does not, of itself, actually need oversight. Nothing will break if students are allowed to access inappropriate material; no system errors will result if abusive emails are sent, or passwords exchanged.

It is also true that cost may be an important factor in the appropriate use of an ICT. We have already considered the case of a school where lack of installed bandwidth seriously limited ICT use; financially driven decisions made without consideration of ethical issues might well lead to less visible problems. Clearly, efficient use of scarce resources needs to be monitored and controlled; but it is important to appreciate that an ICT system is not in the same category as an overhead projector, or even a new teaching facility. It needs a different degree of consideration, and a different administrative approach.

What is perhaps more likely in practice is that lessons learned in other areas of educational administration may be unquestioningly transferred, bringing a potential for ethical dissonance between the traditional and the technological. As a key player in the successful establishment of an ICT, the educational administrator would be well advised to consider the appropriateness of their traditional views, in what is still a very new field.

## Conclusions

In this paper we considered issues involving educational Information and Communications Technologies from several perspectives. Initially seeking distinguishing individual perspectives of particular importance to informed discussion of ICTs, three constituent approaches were identified – those of educator, developer, and educational administrator. We

then looked in more depth at the relationship of each of these groups to ICT development, identifying aspects of their roles and responsibilities which might result in what was described as *ethical dissonance* – where previously held beliefs, when transferred to the potentially global field of electronic communication, might create ethical problems.

It seems clear that it is not always either right or even necessary to bring traditional views to the consideration of the new technology. It is certainly true that there are new and important aspects of ICT use which contain the risk of serious ethical problems arising, if lack of specific consideration means they have not been foreseen.

The installation of an ICT has the potential to transform the teaching experience; it can provide vast amounts of valuable source material, and additionally empower its users as communicators – even as global broadcasters. However, such new empowerment brings with it associated risks, not always avoided by reliance upon traditional responses. Consideration in advance of such risks may go a considerable way to preventing both practical and ethical problems.