With an article by HOWARD GARDNER on multiple intelligences

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EDITORIAL

Analyses of the relationship between education and the information technologies are taking place at present on two separate but closely related levels: the role of information technologies in the socialization process; and their role in the learning process. Paradoxically, the opinions that support these two approaches are in conflict with each other. While, from the point of view of socialization, technology—and particularly television—is perceived as a threat to democracy and the training of new generations, from the point of view of the learning process, on the other hand, it is considered as a solution to all the problems of quality and access to education. These two apparently opposing visions do, however, arise from a common root. This source of origin consists in assuming that the active ingredient in the learning process and in socialization arises from the technologies and their messages, and not from the reference points of the participants, which may modify the messages transmitted by the technologies.

Recognizing the central role of the learner and his/her activity in the learning process has very important political and educational implications. The most obvious one is, evidently, the usage of new technologies not as an end in themselves but rather as an adjunct to cognitive development. Here, the article by Howard Gardner, which opens this edition of *Prospects,* puts forward a most interesting hypothesis for the processes of educational transformation. We agree with Gardner that there is no single form of intelligence and, for that matter, of cognitive development, but several, each with its own dimension of development. The need to equate educational provision with this diversity of cognitive profiles represents a very significant political and educational need that new technologies may satisfy or, on the other hand, may obstruct. We stress that the final approach does not depend on the technologies themselves, but on the social, political and educational context in which they exist.

However, the expansion of new information technologies is linked to the accumulation of knowledge by those already involved in these fields. Those who do not participate in this milieu live a precarious existence, similar to that of the information and knowledge that was not included in books and written documents with the arrival of printing.

It is probably this phenomenon, more than the potential of the new technologies from a purely cognitive point of view, that gives rise to the need to make adequate provision for incorporating the technological dimension into democratic educational policies. Not to do so means that all those who do not participate in the arena of the codes that lead to mastery of these instruments are condemned to the sidelines.

The massive inclusion of new communication technologies into education leads to serious cost problems. This matter is not without significance since it implies not only the initial purchase but the continuing investment associated with these technologies (maintenance, continuous updating of the hardware and software, etc.). In this way, large-scale inclusion of new technologies in education means that a problem previously affecting technical and vocational education almost exclusively has now become widespread. General, good quality education can no longer be provided at low cost since it requires more than a classroom, desks and a teacher who directs the class. The battle for resources and who will bear the cost of general education will become increasingly intense and there is no reason to believe that, without constant pressure on the part of the lower classes, the distribution of new technologies will be carried out in a democratic way.

Lastly, the new technologies give a new meaning to the question of living together. One common characteristic of these new technologies is that they imply individual work and that they facilitate contacts between people via screens, plastic credit cards or other means. On this basis, the most extreme viewpoints about the social consequences of the new technologies have been put forward, going from the utopia of everyone being in contact with everybody else, and the suppression of geographical boundaries, distance, time zones, and bureaucratic and political systems, to the Orwellian scenario of a society consisting of isolated individuals, subject to total control from an apparatus capable of knowing every detail of our daily lives.

Different possibilities exist and it would be dangerous to attribute one outcome or another to technology itself. A non-technocratic attitude towards these questions would lead to identifying the social requirements likely to stimulate technological development so as to strengthen social cohesion and not bring about its collapse. In this context, the introduction of new technologies would lead to liberating the time we spend today on routine tasks and on overcoming the spatial and technical obstacles to communication that impoverish personal development. Here, the new technologies would contribute significantly to opening up our access to information. However, all analyses of this subject indicate that, in the same way that information by itself does not equal knowledge, the simple existence of communication does not imply the existence of a community. Technology offers information and facilitates communication, which are necessary conditions for understanding and community. Yet the construction of understanding and community is the work of people, not of machines. This is precisely the role of new technologies in education. Their use should liberate the time that was previously devoted to transmitting and communicating information, and enable it to be used in the construction of knowledge and greater social and personal cohesion.

JUAN CARLOS TEDESCO

POSITIONS/CONTROVERSIES

FOSTERING DIVERSITY THROUGH PERSONALIZED EDUCATION: IMPLICATIONS OF A NEW UNDERSTANDING OF HUMAN INTELLIGENCE[1]

Howard Gardner

In 1983, I published *Frames of mind*, an introduction to the theory of multiple intelligences (MI theory). In that book I presented an alternative to the traditional view of human intelligence. Since the publication of this book, I have become more aware, through the evolution of my own research and through the many educational developments inspired by MI theory, of the educational ramifications of this novel perspective. Given the ongoing interests and efforts to reform education systems and expand educational opportunity around the world, I will present here: the basic tenets of MI theory; outline some of the implications of those ideas for education; clarify some misinterpretations about the theory which have unfolded over time; and present a section of recent developments which may help to obtain a deeper grasp of the theory.

Orignal language: English

Howard Gardner (United States of America)
Professor of Education and Adjunct Professor of Psychology at Harvard University, Adjunct Professor of Neurology at the Boston University School of Medicine, and Co-Director of Harvard Project Zero. Best known in educational circles for his theory of multiple intelligences. Project Zero has designed performance-based assessments and used multiple intelligences to achieve more personalized instruction and assessment. Most recently, Gardner has been carrying out case studies on exemplary creators and leaders, including an investigation of the relationship between cutting-edge work in different domains and a sense of social responsibility. He is the author of fourteen books and several hundred articles, including *Leading minds: an anatomy of leadership* (1996). His newest book, *Extraordinary minds*, will be published in 1997.

MI theory in a nutshell

Since the beginning of the century, a uni-dimensional view of intelligence has prevailed among the community of psychologists. While authors such as L.L. Thurstone, J.P. Guilford and others challenged this tradition, most scholars adhered to a common view of general intelligence as a construct underlying human abilities. I propose a paradigmatic shift in our understanding of intelligence, one that challenges the uni-dimensional view and which has implications about how to organize education.

Unlike others who have preceded me in the study of intelligence, I believe that we should get away altogether from tests and correlations among tests, and look instead at more naturalistic sources of information about how peoples around the world develop skills important to their way of life. Think, for example, of sailors in the Pacific Ocean, who find their way around hundreds, or even thousands, of islands by looking at the constellations of stars in the sky, feeling the way a boat passes over the water, and noticing a few scattered landmarks. A word for intelligence in a society of these sailors would probably refer to that kind of navigational ability. Think of surgeons and engineers, hunters and fishermen, dancers and choreographers, athletes and athletic coaches, tribal chiefs and sorcerers. All of these different roles need to be taken into account if we accept the way I define intelligence—that is, as the ability to solve problems, or to fashion products, that are valued in one or more cultural or community settings. For the moment, I am saying nothing about whether there is one dimension, or more than one dimension, of intelligence; nothing about whether intelligence is inborn or developed. Instead, I emphasize the ability to solve problems and to fashion products. In my work, I seek the building blocks of the intelligences used by the aforementioned sailors and surgeons and sorcerers.

The science of this enterprise, to the extent that it exists, involves trying to discover the right description of the intelligences. What is an intelligence? To try to answer this question, I have, with my colleagues, surveyed a wide set of sources which, to my knowledge, have never been considered together before. One source is what we already know concerning the development of different kinds of skills in normal children. Another source, and a very important one, is information on the ways that these abilities break down under conditions of brain damage. When one suffers a stroke or some other kind of brain damage, various abilities can be destroyed, or spared, in isolation from other abilities. This research with brain-damaged patients yields a very powerful kind of evidence, because it seems to reflect the way the nervous system has evolved over the millennia to yield certain discrete kinds of intelligence.

My research group looks at other special populations as well: prodigies, idiot savants, autistic children, children with learning disabilities, all of whom exhibit very jagged cognitive profiles—profiles that are extremely difficult to explain in terms of a unitary view of intelligence. We examine cognition in diverse animal species and in dramatically different cultures. Finally, we consider two kinds of psychological evidence: correlations among psychological tests of the sort yielded by a careful statistical analysis of a test battery; and the results of efforts in skill training. When you train a person in skill *A*, for exam-

ple, does that training transfer to skill *B*? For example, does training in mathematics enhance one's musical abilities, or vice versa?

As a result of organizing all this information, I have, to date, come up with a list of eight intelligences. These are: linguistic intelligence; logical-mathematical intelligence; spatial intelligence; musical intelligence; body-kinesthetic intelligence; interpersonal intelligence; intra-personal intelligence; and naturalistic intelligence.

Linguistic intelligence is the kind of ability exhibited in its fullest form by poets. *Logical-mathematical intelligence*, as the name implies, is logical and mathematical ability, as well as scientific ability. Jean Piaget, the great developmental psychologist, thought he was studying all intelligence, but I believe he was primarily studying the development of logical-mathematical intelligence. I do not think that linguistic and logical-mathematical intelligences are the most important; on the contrary, I think all eight intelligences have equal claim to priority. In the United States of America, however, we have put linguistic and logical-mathematical intelligences, figuratively speaking, on a pedestal. Much of our testing is based on this high valuation of verbal and mathematical skills. If you do well in language and logic, you should do well in IQ (intelligence quotient) tests and scholastic aptitude tests (SATs), and you may well be accepted into a prestigious college, but whether you do well once you leave is probably going to depend as much on the extent to which you possess and use the other intelligences, and it is to those that I want to give equal attention. Daniel Goleman's recent best-seller, *Emotional intelligence*, makes the same argument.

Spatial intelligence is the ability to form a mental model of a spatial world and to be able to manoeuvre and operate using that model. Sailors, engineers, surgeons, sculptors and painters, to name just a few examples, all have highly developed spatial intelligence. *Musical intelligence* is the fourth category of ability we have identified: Leonard Bernstein had lots of it; Mozart, presumably, had even more. *Bodily-kinesthetic intelligence* is the ability to solve problems or to fashion products using one's whole body, or parts of the body. Dancers, athletes, surgeons and craftspeople all exhibit highly developed bodily-kinesthetic intelligence.

I propose two forms of *personal intelligence*—not well understood, elusive to study, but immensely important. *Interpersonal intelligence* is the ability to understand other people: what motivates them, how they work, how to work co-operatively with them. Successful salespeople, politicians, teachers, clinicians and religious leaders are all likely to be individuals with high degrees of interpersonal intelligence. *Intra-personal intelligence*, a seventh kind of intelligence, is a correlative ability, turned inward. It is a capacity to form an accurate, veridical model of oneself and to be able to use that model to operate effectively in life.

Finally, there is the *intelligence of the naturalist*.[2] The individual who is able readily to recognize flora and fauna, to make other consequential distinctions in the natural world and to use this ability productively (in hunting, in farming, in biological science) is exercising an important intelligence. Individuals like Charles Darwin or E.O. Wilson embody the naturalist's intelligence and, in our consuming culture, youngsters exploit their naturalist's intelligence as they make acute discriminations among cars, sneakers or hairstyles.

These, then, are the eight intelligences that we have uncovered and described in our

research. This is a preliminary list; obviously each form of intelligence can be subdivided, or the list can be rearranged. The real point here is to make the case for the plurality of intellect. Also, we believe that individuals may differ in the particular intelligence profiles with which they are born, and they certainly differ in the profiles that they ultimately possess. I think of these intelligences as raw, biological potentials, which can be seen in pure form only in individuals who are, in the technical sense, freaks. In almost everybody else, the intelligences work together to solve problems, to yield various kinds of cultural end-states—vocations, avocations and the like.

Educational ramifications of MI theory

The uni-dimensional view of intelligence which MI theory challenged underlies a particular way of organizing schooling—a uniform view. In the *uniform school*, there is a core curriculum, a set of facts, concepts and disciplinary skills that everybody should know, and very few elective subjects. The better students, perhaps those with higher IQs, are allowed to take courses that call upon critical reading, calculation and thinking skills. In the 'uniform school', there are regular assessments, using paper and pencil instruments, of the IQ or SAT variety.[3] They yield reliable rankings of people; the best and the brightest get into the better colleges, and perhaps—but only perhaps—they will also get better rankings in life. There is no question that this approach works well for certain people—schools such as Harvard are eloquent testimony to that. Since this measurement and selection system is clearly meritocratic in certain respects, it has something to recommend it.

The alternative view of intelligence presented by MI theory leads to a very different view of the school. This pluralistic view of mind, recognizing many different and discrete facets of cognition, acknowledging that people have different cognitive strengths and contrasting cognitive styles, leads to a view of an individual-centred school. This model for a school is based in part on findings from sciences that did not even exist in Binet's time:[4] cognitive sciences (the study of the mind) and neuroscience (the study of the brain).

In my view, the purpose of school should be to develop intelligences and to help people reach vocational and avocational goals that are appropriate to their particular spectrum of intelligences. People who are helped to do so, I believe, feel more engaged and competent, and are therefore more inclined to serve society in a constructive way.

This view leads to the notion of an *individual-centred school*, one geared to optimal understanding and development of each student's cognitive profile. This vision stands in direct contrast to that of the 'uniform school' I mentioned above.

The design of my ideal school of the future is based upon two assumptions. The first is that not all people have the same interests and abilities; not all of us learn in the same way. (And we now have the technological tools to begin to address these individual differences in school.)

The second assumption is one that hurts: it is the assumption that nowadays no one person can learn everything there is to learn. We would all like, as Renaissance men and women, to know everything, or at least to believe in the potential of knowing everything, but that ideal is clearly not possible anymore. Choice is therefore inevitable, and one of the things that I want to argue is that the choices we make for ourselves, and for

the people who are under our charge, might as well be informed choices. An individual-centred school would be rich in assessment of individual abilities and proclivities. It would seek to match individuals not only to curricular areas, but also to particular ways of teaching those subjects. And, after the first few grades, the school would also seek to match individuals with the various kinds of life and work options that are available in their culture.

I want to propose a new set of roles for educators that might make this vision a reality. First of all, we might have what I will call 'assessment specialists'. The job of these people would be to try to understand as sensitively and comprehensively as possible the abilities and interests of the students in a school. It would be very important, however, that the assessment specialists use 'intelligence-fair' instruments. We want to be able to look specifically and directly at spatial abilities, at personal abilities and the like, and not through the usual lenses of the linguistic and logical-mathematical intelligences. Up until now, nearly all assessment has depended indirectly on measurement of those abilities; if students are not strong in those two areas, their abilities in other areas may be obscured. Once we begin to try to assess other kinds of intelligences directly, I am confident that particular students will reveal strengths in quite different areas, and the notion of general brightness will disappear or become greatly attenuated.

In addition to the assessment specialist, the school of the future might have the 'student/curriculum broker.' It would be his or her job to help match students' profiles, goals and interests to particular curricula and to particular styles of learning. Incidentally, I think that the new interactive technologies offer considerable promise in this area: it will probably be much easier in the future for 'brokers' to match individual students to ways of learning that prove comfortable for them.

There should also be, I think, a 'school/community broker,' who would match students to learning opportunities in the wider community. It would be this person's job to find situations in the community, particularly options not available in the school, for children who exhibit unusual cognitive profiles. I have in mind apprenticeships, mentorships, internships in organizations, 'big brothers', 'big sisters'—individuals and organizations with whom these students might work to secure a feeling for different kinds of vocational and avocational roles in the society.

I am not worried about those occasional youngsters who are good at everything. They are going to succeed in any case. I am concerned about those who do not shine on the standardized tests and who, therefore, tend to be written off as not having gifts of any kind. It seems to me that the school/community broker could spot these youngsters and find placements in the community that provide chances for them to shine.

There is ample room in this vision for teachers as well, and also for master teachers. In my view, teachers would be freed to do what they are supposed to do, which is to teach their subject matter, in their preferred style of teaching. The job of master teacher would be very demanding. It would involve, first of all, supervising the novice teachers and guiding them; but the master teacher would also seek to ensure that the complex student/assessment/curriculum/community equation is balanced appropriately. If the equation is seriously imbalanced, master teachers would intervene and suggest ways to make things better.

Clearly, what I am describing is a tall order; it might even be called utopian. And

there is a major risk to this programme, of which I am well aware. That is the risk of premature billeting—of saying, 'Well, Johnny is 4. He seems to be musical, so we are going to send him to the conservatoire and drop everything else.' There is, however, nothing inherent in the approach that I have described that demands this early over-determination—quite the contrary. It seems to me that early identification of strengths can be very helpful in indicating the kinds of experiences from which children might profit; but early identification of weaknesses can be equally important. If a weakness is identified early, there is a chance of attending to it before it is too late, and to come up with alternative ways of teaching or of covering an important skill area.

We now have the technological and the human resources to implement such an individual-centred school. Achieving it is a question of will, including the will to withstand the current enormous pressures toward uniformity and uni-dimensional assessments. There are strong pressures now, which you read about every day in the newspapers, to compare students, to compare teachers, regions, even entire countries, using one dimension or criterion, a kind of crypto-IQ assessment. Clearly, everything I have stated here stands in opposition to that particular view of the world. Indeed, that is my intent—to provide a ringing indictment of such one-track thinking.

I believe that there is not a single educational approach which would follow from MI theory.[5] MI theory is in no way an educational prescription. There is always a gulf between psychological claims about how the mind works, and educational practices; and such a gulf is especially apparent in a theory that was developed without specific educational goals in mind. Thus, in educational discussions, I have always taken the position that educators are in the best position to determine the uses to which MI theory can and should be put.

Indeed, contrary to much that has been written, MI theory does *not* incorporate a 'position' on tracking, gifted education, interdisciplinary curricula, the organization of the school day, length of the school year, or many other 'hot' educational issues. I have tried to encourage certain 'applied MI efforts', but in general my advice has echoed the traditional Chinese adage: 'Let a hundred flowers bloom'. And often I have been surprised and delighted by the fragrance of some of these fledgling plants—for example, the use of a 'multiple intelligences curriculum' in order to facilitate communication among youngsters drawn from different cultures; or the conveying of pivotal principles in biology or social studies through a dramatic performance designed and staged by students.

I have become convinced, however, that, while there is no 'right way' to conduct a multiple intelligences education, some current efforts go against the spirit of my formulation and embody one or more myths. Let me mention a few applications that have jarred me:

- The attempt to teach all concepts or subjects using all the intelligences. As I indicate below, most topics can be powerfully approached in a number of ways. But there is no point in assuming that every topic can be effectively approached in at least eight ways, and it is a waste of effort and time to attempt to do this.
- The belief that it suffices, in and of itself, just to go through the motions of exercising a certain intelligence. Thus, I have seen classes in which children are encouraged to wave their arms, or to run around, on the assumption that exercising one's body represents in itself some kind of MI statement. You should not understand that

I am saying that exercise is a bad thing: it is not. But random muscular movements have nothing to do with the cultivation of the mind—or even of the body!

- The use of materials associated with an intelligence used as background. In some classes, children are encouraged to read or to carry out math exercises, while music is playing in the background. Now, I myself like to work with music in the background. But unless I focus on the performance (in which case the composition is no longer serving as background), the music's function is unlikely to be different from that of a dripping tap or a humming fan.
- The use of intelligences primarily as mnemonic devices. It may well be the case that it is easier to remember a list if one sings it, or even if one dances while reciting it. I have nothing against such aids to memory. However, these uses of the materials of an intelligence are essentially trivial. What is not trivial—as I argue below—is to think musically, or to draw on some of the structural aspects of music in order to illuminate concepts such as biological evolution or historical cycles.
- The conflating of intelligences with other desiderata. This practice is particularly notorious when it comes to the personal intelligences. Interpersonal intelligence has to do with understanding other people—but it is often distorted as a license for co-operative learning or applied to extrovert individuals. Intra-personal intelligence has to do with understanding oneself—but it is often distorted as a rationale for self-esteem programmes or applied to individuals who are loners or introverted. One receives the strong impression that individuals who use the terms in this promiscuous way have never read my own writings on intelligence.
- The direct evaluation (or even grading) of intelligences, without regard to context or content. Intelligences ought to be seen at work when individuals are carrying out productive activities that are valued in a culture. And that, in general, is how reporting of learning and mastery should take place. I see little point in grading individuals in terms of how 'linguistic' or how 'bodily-kinesthetic' they are; such a practice is likely to introduce a new and unnecessary form of tracking and labelling. As a parent (or as a supporter of education who resides in the community), I am interested in the *uses* to which children's intelligences are put; reporting should have this focus. Note that it is reasonable, for certain purposes, to indicate that a child seems to have a relative strength in one intelligence and a relative weakness in another. However, these descriptions should be mobilized in order to help students perform better in meaningful activities and perhaps even to show that a labelling was premature or erroneous.

Having illustrated some problematic applications of MI theory, let me now indicate three more positive ways in which MI can be—and has been—used in the schools:

1. *The cultivation of desired end-states*. Schools should cultivate those skills and capacities that are valued in the community and in the broader society. Some of these desired roles are likely to highlight specific intelligences, including ones that have usually been given short shrift in the schools. If, say, the community believes that children should be able to perform on a musical instrument, then the cultivation of musical intelligence toward that end becomes a value of the school. Similarly, emphasis on such end-states as taking into account the feelings of others, being able to plan one's

own life in a reflective manner, or being able to find one's way around an unfamiliar terrain are likely to result in an emphasis on the cultivation of interpersonal, intrapersonal and spatial intelligences, respectively.

2. *Approaching a concept, subject matter, or discipline in a variety of ways.* Along with many other school reformers of the day, I am convinced that schools attempt to cover far too much material, and that superficial understandings (or non-understandings) are the inevitable result. It makes far more sense to spend a significant amount of time on key concepts, generative ideas, essential questions, and allow students to become thoroughly familiar with these notions and their implications.

   Once the decision has been made to dedicate time to particular items, it then becomes possible to approach those topics or notions in a variety of ways. Not necessarily in eight, let alone eighty ways, but in a number of ways that prove pedagogically appropriate for the topic at hand. Here is where multiple intelligences comes in. As I argue in *The unschooled mind*,[6] nearly every topic can be approached in a variety of ways, ranging from the telling of a story, through a formal argument, to an artistic exploration, to some kind of 'hands-on' experiment or simulation. Such pluralistic approaches should be encouraged.

   When a topic has been approached from a number of perspectives, three desirable outcomes ensue. First of all, because children do not all learn in the same way, more children will be reached—I term this desirable state-of-affairs 'multiple windows leading into the same room'. Second, students secure a sense of what it is like to be an expert when they behold that a teacher can represent knowledge in a number of different ways, and that they themselves are also capable of more than a single representation of a specified content. Finally, since understanding can also be demonstrated in more than one way, a pluralistic approach opens up the possibility that students can demonstrate *their* new understandings—as well as their continuing difficulties—in ways that are comfortable for them and accessible to others.

   Performance-based examinations and exhibitions are tailor-made for bringing to the fore a student's multiple intelligences.

3. *The personalization of education.* Without a doubt, one of the reasons that MI theory has attracted attention in the educational community is because of its ringing endorsement of an ensemble of propositions: we are not all the same; we do not all have the same kinds of minds; education works most effectively for most individuals if these differences in mentation and strengths are taken into account rather than denied or ignored. I have always believed that the heart of the MI perspective—in theory and in practice—inheres in taking extremely seriously the differences among human beings. At the theoretical level, one acknowledges that all individuals cannot be profitably arrayed on a single intellectual dimension. At the practical level, one acknowledges that any uniform educational approach is likely to serve only a minority of children.

   When I visit an 'MI school,' I look for evidence of personalization: evidence that all involved in the educational encounter take such differences among human beings extremely seriously; evidence that they construct curricula, pedagogy and assessment insofar as possible in the light of these differences. All the MI posters, indeed all the

references to me personally, prove of little avail if the youngsters continue to be treated in a homogenized fashion. By the same token, whether or not members of the staff have even heard of MI theory, I would be happy to send my children to a school with the following characteristics: differences among youngsters are taken seriously; knowledge about differences is shared with children and parents; children gradually assume responsibility for their own learning; and materials that are worth knowing are presented in ways that afford each child the maximum opportunity to master those materials and to show others (and themselves) what they have learned and understood.

Clearing up some misconceptions about MI theory

In the fourteen years since *Frames of mind* was published, I have heard, read and seen several hundred different interpretations of what MI theory is and how it can be applied in the schools.[7] Until now, I have been content to let MI theory take on a life of its own. As I saw it, I had issued an 'ensemble of ideas' to the outer world, and I was inclined to let them fend for themselves. Yet, in light of my own readings and observations, I believe that the time has come for me to share my own responses to those interpretations.

In this section, I discuss seven myths that have grown up about multiple intelligences and, by putting forth seven complementary 'realities,' I attempt to set the record straight.

Myth no. 1: Now that eight intelligences have been identified, one can—and perhaps should—create eight tests and secure eight scores.

Reality no. 1: MI theory represents a critique of 'psychometrics-as-usual'. A battery of MI tests is inconsistent with the major tenets of the theory.

Comment: My concept of intelligences is an outgrowth of accumulating knowledge about the human brain and about human cultures: it is not the result of *a priori* definitions nor of factor analyses of test scores. As such, it becomes crucial that intelligences be assessed in ways that are 'intelligence-fair,' in ways that examine the intelligence directly rather than through the lens of linguistic or logical intelligence (as ordinary paper-and-pencil tests do).

Thus, if one wants to look at spatial intelligence, one should allow an individual to explore a terrain for a while and see whether he/she can find his/her way around it reliably. Or if one wants to examine musical intelligence, one should expose an individual to a new melody in a reasonably familiar idiom and see how readily the person can learn to sing it, recognize it, transform it and the like.

Assessing multiple intelligences is not a high priority in every setting. But when it is necessary or advisable to assess an individual's intelligences, it is best to do so in a comfortable setting with materials (and with cultural roles) that are familiar to that individual. These conditions are at variance with our general conception of testing, as a de-contextualized exercise using materials that are unfamiliar by design; but there is no reason in principle why an 'intelligence-fair' set of measures cannot be devised. The production

of such useful tools has been our goal in such projects as Spectrum, Arts PROPEL, and Practical Intelligences for Children (PIFS).[8]

Myth no. 2: An intelligence is the same as a domain or a discipline.

Reality no. 2: An intelligence is a new kind of construct, and it should not be confused with a domain or a discipline.

Comment: I must shoulder a fair part of the blame for the propagation of this myth. In writing *Frames of mind,* I was not as careful as I should have been in distinguishing intelligences from other related concepts. As I have now come to understand, largely through my interactions with Mihaly Csikszentmihalyi and David Feldman,[9] an *intelligence* is a biological and psychological potential; that potential is capable of being realized to a greater or lesser extent as a consequence of the experiential, cultural and motivational factors that affect a person.

In contrast, a *domain* is an organized set of activities within a culture, one typically characterized by a specific symbol system and its attendant operations. Any cultural activity in which individuals participate on more than a casual basis, and in which degrees of expertise can be identified and nurtured, should be considered as a domain. Thus, physics, chess, gardening and rap music are all domains in Western culture. Any domain can be realized through the use of several intelligences: thus the domain of musical performance involves bodily-kinesthetic and personal as well as musical intelligences. By the same token, a particular intelligence, like spatial intelligence, can be put to work in a myriad of domains, ranging from sculpture to sailing to neuro-anatomical investigations.

Finally, the *field* is the set of individuals and institutions that judge the acceptability and creativity of products, fashioned by individuals (with their characteristic intelligences) within established or new domains. Judgements of quality cannot be made apart from the operation of members of a field, though it is worth noting that both the members of a field, and the criteria that they employ, can and do change over time.

Myth no. 3: An intelligence is the same as a 'learning style', 'cognitive style' or 'working style'.

Reality no. 3: The concept of *style* designates a general approach that an individual can apply equally to every conceivable content. In contrast, an *intelligence* is a capacity, with its component processes, that is geared to a specific content in the world (like musical sounds or spatial patterns).

Comment: To highlight the difference between an intelligence and a style, consider this contrast. If a person is said to have a 'reflective' or an 'intuitive' style, this designation assumes that the individual will be reflective or intuitive with all matter of content, ranging from language, to music, to social analysis. However, such an assertion reflects an empirical assumption that actually needs to be investigated. It might well be the case that an individual is reflective with music, but fails to be reflective in a domain that requires mathematical thinking; or that a person is highly intuitive in the social domain but is not in the least intuitive when it comes to mathematics or mechanics.

In my view, the relation between my concept of intelligence, and the various conceptions of style, needs to be worked out empirically, on a style-by-style basis. We cannot assume that style means the same thing to Carl Jung, Jerome Kagan, Tony Gregoric, Bernice McCarthy, and other inventors of stylistic terminology.[10] There is little authority for assuming that an individual who evinces a style in one milieu or with one content, will necessarily do so with other diverse contents—even less authority for equating styles with intelligences.

Myth no. 4: MI theory is not empirical.
(Variant of Myth no. 4: MI theory is empirical and has been disproved.)

Reality no. 4: MI theory is based wholly on empirical evidence and can be revised on the basis of new empirical findings.

Comment: Anyone who puts forth Myth no. 4 cannot have read *Frames of mind*. Literally hundreds of empirical studies were reviewed in that book, and the actual intelligences were identified and delineated on the basis of empirical findings. The seven intelligences described in *Frames of mind* (and the eighth that has recently been proposed) represent my best-faith effort to identify mental abilities of a size that could be readily discussed and critiqued.

No empirically-based theory is ever established permanently. All claims are at risk in the light of new findings. In the last several years, I have collected and reflected upon empirical evidence that is relevant to the claims of MI theory, 1983 version. Thus, work on the development in children of a 'theory of mind', as well as the study of pathologies in which an individual loses a sense of social judgement, have provided fresh evidence for the importance and independence of interpersonal intelligence.[11] In contrast, the findings of a possible link between musical and spatial thinking has caused me to reflect on the possible relations between faculties that have previously been thought to be independent.[12] Many other lines of evidence could be mentioned here: the important point is that MI theory is constantly being reconceptualized in terms of new findings from the laboratory and from the field (see also Myth no. 7).

Myth no. 5: MI theory is incompatible with 'g' (general intelligence),[13] with hereditarian accounts or with environmental (cultural) contents.

Reality no. 5: MI theory questions not the existence, but the province and explanatory power of 'g'. By the same token, MI theory is neutral on the question of heritability of specific intelligences, proposing instead the underscoring of the centrality of gene-environmental interactions.

Comment: Interest in 'g' comes chiefly from those who are probing scholastic intelligence, and those who traffic in the correlations among test scores. (Recently there have been interests in the possible neuro-physiological underpinnings of 'g';[14] and sparked by the publication of *The bell curve*,[15] interest in the possible social consequences of 'low g'). While I have been critical of much of the research in the 'g' tradition, I do not consider the study

of 'g' to be scientifically improper, and I am willing to accept the utility of 'g' for certain theoretical purposes. My interest, obviously, centres on those intelligences and intellectual processes that are not covered by 'g'.[16]

While a major animating force in psychology has been the study of the heritability of intelligence(s), my inquiries have not been oriented in this direction. I do not doubt that human abilities, and human differences, have a genetic base: can any serious scientist question this at the end of the twentieth century? And I believe that behavioural genetic studies, particularly of twins reared apart, can illuminate certain issues.[17] However, along with most biologically-informed scientists, I reject the 'inherited vs. learned' dichotomy and instead stress the interaction, from the moment of conception, between genetic and environmental factors.

Myth no. 6: MI theory so broadens the notion of intelligence that it includes all psychological constructs and thus vitiates the usefulness, and the usual connotation, of the term.

Reality no. 6: This statement is simply wrong. In my view, it is the standard definition of intelligence that narrowly constricts our view, treating a certain form of scholastic performance as if it encompassed the range of human capacities and leading to disdain for those who happen not to be psychometrically bright. Moreover, I reject the distinction between talent and intelligence; in my view, what we call 'intelligence' in the vernacular, is simply a certain set of 'talents' in the linguistic and/or logical-mathematical spheres.

Comment: MI theory is about the intellect, the human mind in its cognitive aspects. I believe that a treatment in terms of a number of semi-independent intelligences presents a more sustainable conception of human thought than one that posits a single 'bell curve' of intellect.

Note, however, that MI theory makes no claims whatsoever to deal with issues beyond the intellect. MI theory is not, and does not pretend to be, about personality, will, morality, attention, motivation, and other psychological constructs. Note, as well, that multiple intelligences theory is not connected to any set of morals or values. An intelligence can be put to an ethical or an anti-social use. Poet and playwright Johann Wolfgang von Goethe and Nazi propagandist Joseph Goebbels were both masters of the German language; but how different were the uses to which they put their talents!

Myth #7: MI theory favours an unrigorous curriculum.

Comment: There is a belief that I favour an unrigorous curriculum, one that spurns the standard disciplines, hard work and regular assessment. Nothing could be further from the truth. I am actually a proponent of teaching the classical disciplines and I attempt to adhere to the highest standards, both for others and for myself. Unlike many readers, I see no incompatibility whatsoever between a belief in MI and a pursuit of a rigorous education. Rather, I feel that only if we recognize multiple intelligences can we reach more students, and give those students the opportunity to demonstrate what they have understood.

Toward a deeper grasp of the theory

In this section I state key tenets of MI theory and suggest their possible educational implications.

THE INTELLIGENCES ARE BASED ON EXPLICIT CRITERIA

What makes MI theory more than a parade of personal preferences is a set of eight criteria that were laid out explicitly in *Frames of mind*. These range from the existence of populations that feature an unusual amount of a certain intelligence (e.g. prodigies), to localization of an intelligence in particular regions of the brain, to susceptibility to encoding in a symbolic system. Of the many candidate intelligences proposed and reviewed so far (e.g. auditory or visual; humour or cooking; intuitive or moral), only eight have qualified in terms of these criteria. Those who would posit additional intelligences have the obligation to assess candidates on these criteria, and to make available the results of this evaluation.

The intelligences reflect a specific scientific wager. As I envision them, the intelligences have emerged over the millennia as a response to the environments in which humans have lived. They constitute, as it were, a cognitive record of the evolutionary past. If my list of intelligences is close to the mark, it will mean that my colleagues and I have succeeded in identifying what the brain has evolved to do—to use a current phrase, that 'we have carved nature at its proper joints'.

To be sure, culture has not evolved simply to fit nature; but the kinds of skills that we expect individuals to achieve do reflect the capacities that individuals actually possess. The challenge confronting educators is to find a way of helping individuals to employ their distinctive intellectual profiles in order to help master the tasks and disciplines needed to thrive in the society.

THE INTELLIGENCES RESPOND TO SPECIFIC CONTENT IN THE WORLD

Scientifically, an intelligence is best thought of as a 'bio-psychological construct': that is, if we understood much more than we do about the genetic and neural aspects of the human mind, we could delineate the various psychological skills and capacities that humans are capable of exhibiting. However, despite the convenient existence of the word, it makes little sense to think of intelligences in the abstract. Intelligences only come into being because the world in which we live features various contents—among them, the sounds and syntax of language, the sounds and rhythms of music, the species of nature, the other persons in our environment, and so on.

These facts lead to the most challenging implication of MI theory. If our minds respond to the actual varied contents of the world, then it does not make sense to posit the existence of 'all-purpose' faculties. There is, in the last analysis, no *generalized* memory: there is memory for language, memory for music, memory for spatial environments, and so on. Nor, despite current buzzwords, can we speak about critical or creative thinking in an

unmodified way. Rather, there is critical thinking using one or more intelligences, and there is creativity in one, or in more than one, domain.

Powerful educational implications lurk here. We must be leery about claiming to enhance general abilities, like thinking or problem-solving or memory; it is important to examine *which* problem is being solved, *which* kind of information is being memorized. Even more importantly, the teacher must be wary of claims about transfer. Though transfer of skill is a proper goal for any educator, such transfer cannot be taken for granted—and especially not when such transfer is alleged to occur across intelligences. The cautious educator assumes that particular intelligences can be enhanced, but remains sceptical of the notion that use of one set of intellectual skills will necessarily enhance others.

WE CANNOT ASSESS INTELLIGENCES

Despite the seductive terminology, we cannot assess intelligences: we can at most assess proficiency in different tasks. Given the positing of multiple intelligences, there is an almost inevitable slippage towards the idea that we could assess an individual's intelligences, or profile of intelligences. And even those who recognize the limits (or inappropriateness) of standard measures, are still tempted to create some kind of a battery or milieu that 'takes the temperature' of different intelligences. I know: I have more than once succumbed to this temptation myself.

But because intelligences are the kinds of constructs that they are, it is simply not possible to assess an individual intelligence or an individual's intelligences with any degree of reliability. All that one can ever assess in psychology is performance on some kind of task. And so, if an individual does well in learning a melody and in recognizing when that melody has been embedded in harmony, we do not have the right to proclaim him/her as 'musically intelligent'; the most that we can infer is that the individual has presumptively exhibited musical intelligence on this single measure.

The greater the number of tasks sampled, the more likely it is that a statement about 'strength' or 'weakness' in an intelligence will acquire some validity. Even here, however, one must be careful. For just because it *appears* that a task was solved by the use of a particular intelligence, we cannot be certain that this is so. A person is free to solve a task in whichever manner he likes. Inferences about mind or brain mechanisms can only be made as a result of carefully designed experiments, ones that most educators (and, truth to tell, most researchers) are in no position to conduct.

For informal purposes, it is certainly acceptable to speculate that a person is relying on certain intelligences rather than others, or that he/she exhibits a strength in one but not another intelligence. However, because actual inference about intelligences is problematic, educators should be cautious about describing the intellectual profiles of students. While seven or eight labels may be preferable to one ('smart' or 'stupid'), labelling can still be pernicious, and particularly so when there is little empirical warrant for it.

THE ROAD BETWEEN THEORY AND PRACTICE RUNS IN TWO DIRECTIONS

Many individuals—practitioners as well as researchers—adopt a jaundiced view of the relation between theory and practice. On this 'conduit' view, researchers collect data

and then develop theories about a topic (say, the nature of human intelligence); the implications of the theories are reasonably straightforward (e.g., let us train all intelligences equally); and practitioners consume the material and attempt to apply the theory as faithfully as possible (*voilà*—behold, a multiple intelligences classroom!).

This description is wrong in every respect. Within the research world, the relations among theory, data and inference are complex and ever-changing. Any theoretical statement or conclusion can lead to an indefinite number of possible practical implications. Only actual testing 'in the real world' will indicate which, if any, of the implications holds water. And most important, those who theorize about the human world have as much to learn from practitioners as vice versa.

Continuing the confessional mode of this essay, I freely admit that I once held a version of this mental model. While I was not initially bent on applying my theory in practical settings, I assumed that the theory would be revised in the light of further research and nothing else.

Here the events of the past decade have been most auspicious—and most enlightening. My colleagues and I have learned an enormous amount from the various practical projects that have been inspired by MI theory.

Developmental psychology and cognitive psychology confirm an important lesson: it is not possible to short-circuit the learning process. Even those with more than a nodding acquaintance with 'MI theory' need to work out their understandings in their own way and at their own pace. And if my own understanding of the theory continues to change, I can hardly expect anyone else to accept any 'reading' as conclusive—even that of the founding theorist.

Concluding thoughts

I am often asked for my views about schools that are engaged in MI efforts. The implicit question may well be: 'Aren't you upset by some of the applications that are carried out in your name?'

In truth, I do not expect that initial efforts to apply any new ideas are going to be stunning. Human experimentation is slow, difficult and filled with zigs and zags. And so I fully expect the initial applications of any set of innovative ideas will sometimes be half-hearted, superficial or even wrong-headed.

For me the crucial question concerns what has happened in a school (or class), two, three or four years after it has made a commitment to an MI approach. Often, the initiative will be long since forgotten—the fate, for better or worse, of most educational experimentation. Sometimes, the school will get stuck in a rut, repeating the same procedures of the first days, without having drawn any positive or negative lessons from this exercise. Needless to say, I am not happy with either of these outcomes.

I cherish an educational setting where discussions and applications of MI have catalyzed a more fundamental consideration of schooling: its overarching purposes, its conceptions of what a productive life will be like in the future, its pedagogical methods, and its educational outcomes, particularly in the context of the values of that specific community. Such discussions generally lead to more thoughtful schooling. Visits with other

schools and more extended forms of networking among MI enthusiasts (and critics) constitute important parts of this building process. If, as a result of these discussions and experiments, a more personalized education is the outcome, I feel that the heart of MI theory has been embodied. And if this personalization is fused with a commitment to the achievement of worthwhile (and attainable) educational understandings for all children, then the basis for a powerful education has indeed been laid.

The MI endeavour is a continuing and changing one. There have emerged over the years new thoughts about the theory, new understandings and misunderstandings, and new applications—some very inspired, some less so. Especially gratifying to me has been the demonstration that this process is dynamic and interactive: no one, not even its creator, has a monopoly on MI wisdom or foolishness. Practice is enriched by theory, even as theory is transformed in the light of the fruits and frustrations of practice. The burgeoning of a community that takes MI issues seriously is not only a source of pride to me but also the best guarantor that the theory will continue to live in the years ahead.

It is of the utmost importance that we recognize and nurture all of the varied human intelligences, and all of the combinations of intelligences. We are all so different, largely because we all have different combinations of intelligences. If we recognize this, I think we will have at least a better chance of dealing appropriately with the many problems that we face in the world. If we can mobilize the spectrum of human abilities, not only will people feel better about themselves and more competent; it is even possible that they will also feel more engaged and better able to join the rest of the world community in working for the broader good. Perhaps, if we can mobilize the full range of human intelligences and ally them to an ethical sense, we can help to increase the likelihood of our survival on this planet, and perhaps even contribute to our thriving.

Notes

1. This paper draws freely from three earlier publications by the author: Chapter 1 of *Multiple intelligences: the theory in practice,* New York, Basic Books, 1993; Reflections on multiple intelligences: myths and messages, *Phi delta kappan* (Bloomington, IN), November 1995; and Probing more deeply into the theory of multiple intelligences, *NASSP bulletin* (Reston, VA), November 1996. I am grateful to Fernando Reimers, who undertook this collation.
2. This is a more recent development in MI theory. In its original formulation, only the first seven intelligences were proposed.
3. The SAT, the scholastic aptitude test, is widely used in the United States to assess general ability in screening college applicants.
4. For a profile of Binet, see the special series 'Thinkers on education' in *Prospects,* vol. XXIII, no. 1-2, p. 101–12.
5. For a bibliography until 1992, see the Appendices to Gardner, 1993, op. cit.
6. *The unschooled mind.* New York, Basic Books, 1991.
7. See Gardner, 1993, op. cit.
8. See Gardner, 1991 and 1993, op. cit.
9. M. Csikszentmihalyi, Society, culture, and person: a systems view of creativity. *In:* R.J. Sternberg, ed. *The nature of creativity,* p. 325–29. New York, Cambridge University Press, 1988; M. Csikszentmihalyi, *On composing a creative life.* New York, HarperCollins, (in press); D.H.

Feldman, Creativity: dreams, insights, and transformations. *In:* R.J. Sternberg, ed. *The nature of creativity*, p. 271–97, op. cit.; D.H. Feldman, M. Csikszentmihalyi and H. Gardner. *Changing the world: a framework for the study of creativity*. Westport, CT, Greenwood Publishing Co., 1994.

10. For a comprehensive discussion of the notion of cognitive style, see: N. Kogan, Stylistic variation in childhood and adolescence. *In:* P. Mussen, ed. *Handbook of child psychology, vol. 3*, p. 630–706. New York, Wiley, 1983.
11. For writings pertinent to the personal intelligences, see: J. Astington, *The child's discovery of the mind*. Cambridge, MA, Harvard University Press, 1993. See also: A. Damasio, *Descartes' error*. New York, Grosset/Putnam, 1994.
12. On the possible relation between musical and spatial intelligence, see: F. Rauscher, G.L. Shaw and K.N. Ny, Music and spatial task performance. *Nature* (London), no. 365, 14 October 1993, p. 6,447.
13. The most thorough exposition of 'g' can be found in the writings of Arthur Jensen. See, for example, *Bias in mental testing*. New York, Free Press, 1980. For a critique, see Stephen J. Gould, *The mismeasure of man*, New York, Norton, 1981.
14. Interest in the neurophysiological bases of 'g' can be found in the writings of Arthur Jensen. See, for example, Why is reaction time correlated with psychometric 'g'? *Current directions of psychological science* (Cambridge, U.K.), vol. 2, no. 2, 1993, p. 53–56.
15. R. Herrnstein, and C. Murray, *The bell curve*, New York, Free Press, 1994.
16. For my view on intelligences not covered by 'g' see: H. Gardner, Cracking open the IQ box [Review of R. Herrnstein and C. Murray, *The bell curve*]. *The American prospect* (Cambridge, MA), no. 20, Winter 1995, p. 71–80.
17. On behavioural genetics and psychological research, see: T. Bouchard and P. Propping, eds., *Twins as a tool of behavioral genetics*, Chichester, U.K., Wiley, 1993.

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OPEN FILE

NEW TECHNOLOGIES IN EDUCATION II

INTRODUCTION TO THE OPEN FILE

Evgueni Khvilon

The rapid development of information and communication technologies (ICTs) and their application present the world community not only with opportunities but also with new challenges. The evolution towards the so-called 'information highway' and its associated economic, social, cultural and educational effects could lead to considerable changes in forms of governance, creativity, co-operation, sharing of ideas and knowledge, as well as in daily life. It will also call for wider participation and action on the part of national, regional and international organizations and agencies.

Under its Constitution, UNESCO is required 'to collaborate in the work of advancing the mutual knowledge and understanding of peoples, through all means of mass communication and, to that end, recommend such international agreements as may be necessary to promote the free flow of ideas by word and image' [. . .], 'give fresh impulse to popular education and to the spread of culture' and 'maintain, increase and diffuse knowledge'.

Consistent with its unique intellectual and ethical mandate, UNESCO organized, in co-operation with the Government of the Russian Federation, the second International Congress on Education and Informatics (EI'96): Educational Policies and New Technologies, in accordance with the Resolution 1.18 of the twenty-seventh session of its General Conference (October–November 1993). The congress was held in Moscow from 1 to 5 July 1996 and was hosted by Lomonosov Moscow State University.

It should be noted that the first congress on 'Education and Informatics: Strengthening International Co-operation', held in Paris in 1989, had stressed the need to benefit from collective experience and the sharing of scarce resources in the field of new information and communication technologies in education and, to this effect, recommended that international co-operation be strengthened.

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Thus, the second Congress, which offered an international forum for the discussion of problems of immediate concern for all countries in the world, was intended to pursue the following objectives: (i) to analyze national, regional and international trends and experiences in the introduction and use of new information and communication technologies in educational systems; (ii) to review the latest developments in the field of new information and communication technologies and examine their application in education; (iii) to discuss international, regional and national policies for the use of these technologies in education; and (iv) to make recommendations for international co-operation.

As is usual for international congresses of this type, UNESCO invited Member States, international governmental and non-governmental organizations, other specialized agencies of the United Nations System, professional associations as well as private companies active in the field of introducing and applying new information and communication technologies in education to designate participants and observers in their personal capacity. Participants and observers, estimated at about 1,000, included ministers, members of parliament, decision-makers, teachers, researchers, students, software and hardware developers, representing seventy-one countries and nine international governmental and non-governmental organizations.

The programme of the Congress was prepared by an International Programme Committee (IPC), which included members of the academic community, presidents of universities, researchers and experts, representing all regions of the world. Academician Yuri L. Ershov (Russian Federation) and Professor Jef Moonen (Netherlands) acted as IPC Co-Chairpersons. For the co-ordination of all preparatory activities and co-operation with UNESCO, the Government of the Russian Federation established a Russian Organizing Committee, consisting of ministers and rectors of leading Russian higher education institutions, headed by Mr. Vladimir G. Kinelev, Deputy Chairman of the Government of the Russian Federation and Chairman of the State Committee for Higher Education.

In order to identify the priorities and needs of Member States concerning the introduction and implementation of information and communication technologies in education, ten regional and sub-regional expert meetings/seminars were organized between 1994 and 1996 in preparation for the congress.

In keeping with the established programme, the congress conducted its work in plenary and commission sessions. Commission I focused its debates on trends and experiences in the introduction and use of ICTs in education systems; Commission II on the latest developments in ICTs in education; and Commission III on international co-operation in the use of ICTs in education.

Six major themes were selected to address the needs of all those involved in the educational process at various levels. The first one dealt with 'Learners' (learning tools, new roles for learners, new options for learning inside and outside educational institutions); the second was devoted to 'Teachers' (current practices with new technologies, pre- and in-service teacher training, new roles for teachers); the third theme focused on 'Technologies' (computer science, computer-enhanced instruction, traditional educational technologies, multimedia and telematics); the fourth theme dealt with 'Social, economic and cultural issues' (the role of ICTs in helping to ensure equal opportunities for the development of skills and knowledge; how the new learning and teaching methods, taking advantage

of the already existing networks, can contribute to overcoming social, economic and cultural barriers with reasonable and cost-effective solutions; negative and positive changes in society under the pressure of developing technology); the fifth theme covered 'Educational policies' (developing national plans, strategies for change at the institutional level, strategies for a future curriculum); and the sixth theme centred on 'International co-operation' (the need for international co-operation in the human-resource development area, the increasing role of UNESCO in promoting international co-operation in the field of open and distance education among interested partners).

In addition to the plenary and commission sessions, twelve workshops were organized on 4 and 5 July 1996 on the following topics: 'Information superhighways and education'; 'The psychological-pedagogical impact and the medical consequences of the application of modern information and communication technologies'; 'The software environment—a perspective for effective involvement' ; 'Transfer of knowledge and skills through information and communication technologies'; 'National policies—transfer of technologies'; 'Individual distance training'; 'Analysis of UNESCO/IFIP documents published in 1994–1995 (Part I: Informatics for secondary education—a curriculum for schools; Part II: A modular curriculum in computer science)'; 'Logics, informatics and education'; 'Information technologies and humanities education'; 'Development of pre-university education via modern information technologies and methods'; 'Medicine: new approaches to knowledge acquisition and improvement'; 'Forming integrated world data bases'; and 'Knowledge about planets of the Solar System and their use in research and education'.

At the end of its work, the congress adopted a Declaration and Recommendations addressed to Member States and to the Director-General of UNESCO, as well as proposals for international co-operation and specific major projects in the field, notably for the benefit of developing countries, aimed at narrowing the gap between the 'haves' and the 'have-nots'.

The articles selected to be published in the present issue of *Prospects* are highly representative, both in terms of the wide range of the topics covered and the diversity of the viewpoints expressed by the invited speakers. There was a general consensus that the new ICTs have the potential of bringing about a fundamental reshaping and change in the ways in which people organize their lives, interact with each other and participate in the various socio-economic activities. These technologies have become decisive instruments in the development strategy and policy of any country.

Universities worldwide have developed programmes aimed at introducing new technologies in order to increase the efficiency of the teaching/learning process, to create more opportunities for distance learning, and to give students more time for individual study. The special tasks of universities is to advance knowledge through research in the field, to experiment with the application of new technologies and to caution us about the risk of excesses.

By way of conclusion, I would like to mention several recommendations adopted by participants, included in the principal Declaration and Recommendations, which best illustrate the present concerns worldwide and emphasize the growing role that UNESCO, other United Nations specialized agencies, as well as inter-governmental organizations and non-

governmental organizations in the field should play in order to help address those concerns: (i) the need to make available via the Internet and other suitable distribution channels high-quality case studies and research on the use of ICTs in teaching and learning for all populations (primary, secondary, higher education, adult education, vocational education and special education); (ii) the setting up of pilot projects in order to test new teaching/learning philosophies using ICTs in education—such studies should not only investigate the delivery of the old curricula through ICTs, but also new curricula which the availability of ICTs has enabled; (iii) the need to encourage international co-operation in creating and disseminating programmes that assist in the proficient use of distance education; (iv) national and international agencies should support the dissemination, by appropriate means, of successful strategies and the best practices among teachers and trainers who use ICTs, teachers and their professional associations being encouraged to involve themselves in the process of change to revalidate their roles and to gain mastery of ICTs; (v) Member States and UNESCO should consider supporting and facilitating the sharing of interactive television technology practices and output between countries; (vi) Member States should be encouraged to develop regional and international co-operation aimed at pooling experiences in the use of ICTs, acquired in comparable environments, in order to avoid the repetition of mistakes and the wastage of time and scarce financial resources.

EDUCATION AND CIVILIZATION[1]

Vladimir G. Kinelev

From ancient times

If we attempt to take a look into the future in order to define what the main aspects of education and human civilization will be in the twenty-first century that is advancing on us so relentlessly, we are increasingly aware that the beginning of the next millennium is much more than simply a red-letter day on the world calendar. It impels us to comprehend the past, to form a new understanding of the meaning of life, to determine the contour of the future, as well as—and this is particularly important today—to unite our actions directed towards building a better future for all people living on our beautiful planet Earth.

It has so happened that destiny has bestowed on us the privilege of taking part in this remarkable event and has invested us with great responsibility for what the world will be like in the twenty-first century. These two sentiments compel us to cast a look into the past and read anew the great books of mankind's progress towards knowledge, books in which pages of great triumphs of human reason alternate with pages full of tragedy. I believe that each of us is excited by the thought that most of the pages of this centuries-old chronicle are still capable of arousing our interest in the great revelations and calamities of humanity on its advance over many thousands of years towards the unattainable, and hence even more coveted, Truth. 'Learn the truth, and the truth will make you free'—such is the promise given to man in one of the most ancient of these books.

Already the first few steps taken by mankind along the path of knowledge have confronted us with the problems riveting our attention today: those of the accumulation, selection, systematization and transmission of information. The stone walls of caverns, the clay tablets of the Assyrians, the papyrus manuscripts of the Egyptians and the Greek parchments were the first vehicles of information where our ancestors recorded and tried to

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hand down to succeeding generations their experience of the world around them through drawings, cuneiform characters and letters. However, many centuries passed before man, burdened with the very load of accumulated facts, started to reflect on the necessity of their selection and systematization, and drew an unsteady but crucially important outline of future science.

It is known that science, as the purposeful study of the laws of natural phenomena and society, originated among the ancient Greeks. Their original manner of thinking and acting, as the British scholar John Bernal (1901–71) asserted, consisted precisely in that aspect of their life which we have termed the scientific mode of thinking. By this he implied, not plain knowledge or the art of science, but an ability to separate verifiable facts from allegations arising from emotion and tradition. According to this mode of thinking, the scholar writes, two different aspects may be differentiated: the rational and the realistic, that is, an ability to prove a contention with arguments and a reliance on observed experience.

Science has since traversed a long path of difficulties and contradictions. But what does the experience of ancient peoples tell us? What part of their great heritage is it that we must never forget? It is primarily their constant reference to nature, their faith in the universal principles of life, their determination to proceed in their constructs from the organic unity of the world around them. Science and the arts, in their view, are equal partners in the common process of creation and construction. For instance, in some hymns of the Hindu 'Rigveda' the numerical correlation of the world order draws a definite analogy with music; the principle of harmony in the teachings of Pythagoras and his followers is science and music.

But it is not only the unity of science and the arts that characterize the cognitive activity of our ancestors. They actively used their knowledge to solve many sophisticated practical problems. The observatory on Mount Ida in Asia Minor was built by Cleostrates, not only to observe complex sea currents in the Dardanelles but primarily to maintain the security of Milesian commerce. The excavations of Vigand unearthed the ruins of the Temple of Hera on Samos, reputed to be a pioneering creation in the art of constructional engineering, and even a cursory look at the temple is enough to convince the viewer that its architects and builders had broad knowledge of engineering and a mathematically accurate sense of proportion. This harmony, a challenge to the imagination of modern man, was praised in highly figurative style by the great Russian poetess Marina Tsvetayeva:

We are asleep, but through the slabs of stone
We see a guest from the heavens in a garb of petals.
O world, you need to understand!
A bard discovers in his slumber
The law of stars and the formula of life.

The accumulation of knowledge, and the emergence and development of spiritual and intellectual life appreciably changes ethics and customs. It becomes clear that whoever has learned the mysteries of knowledge accumulates fantastic power by which he or she 'rules everything through all'. The problems of education began to attract not only philosophers

and men of letters, but also politicians. Education assumed a mass scale. Schools and colleges mushroomed.

The intelligence of the ancients deserves admiration. As it seems to me, they were aware, no less clearly than our contemporaries, that a high level of upbringing and education among citizens had enormous significance for the destiny of a State, because upbringing and education shape human character: democratic education serves democracy and reproduces its structural order, while oligarchic education reproduces the oligarchic lineage with equal relentlessness. Time has proved the wisdom of Aristotle's phrase: 'Superior education maintains a superior order'.

Taking a cursory look at the ancient framework of civilization, what do we see? It was built by outstanding architects and engineers; all of the most important elements of education and science have come down to us from hoary antiquity and have maintained their significance until the present.

Succeeding epochs—the Age of Enlightenment and the Renaissance—certainly made a contribution. Here the palm of precedence belongs to Italy, the homeland of the Renaissance. The Russian philosopher A. Losev noted, evidently for a good reason, that the Italians called themselves 'the Renaissance people', knowing nothing about similar events going on in other countries. However, if the Renaissance is interpreted as the awakening of a new social order and the comprehension by the latter in this context of all the enormous possibilities inherent in education, science and information, the scholar was probably right in noting that other 'renaissances' have taken place almost everywhere throughout history in different contexts, although none of them were superior to the culture of the Italian Renaissance.

In any event, it was precisely in Italy that the first European universities arose. Here learned academies and centres of world culture were born. Under its radiant skies, Michelangelo and Leonardo da Vinci created their immortal works. One of the rulers of Florence, Lorenzo Medici, instituted Europe's first public library; the Venetian Republic adopted laws on patents, the first in mankind's history. We owe to the Italian humanists the 'heavenly golden rain of ancient manuscripts' that fertilized the soil of the following eras.

Printing is the next, and perhaps the greatest, stage in the information revolution. It is clear that ancient manuscript scrolls could not lay the foundation for the development of mass education. The invention of printing raised the institutions of general education to a previously unattainable height. The reformer Luther translated the Bible and demanded that the authorities open schools for the enlightenment of young people in all cities and towns of Germany. The famous Czech educationist Comenius[2] wrote the 'Great Didactic', in which he expressed his desire of 'teaching all things to all men', that is, he substantiated theoretically, as it were, the principle of democracy, encyclopedic knowledge and professionalism in education, in which lay many precious seeds of future educational 'harvests'. At a much later date, the great Dénis Diderot would pronounce the wise words praising the book and education: 'People cease thinking when they cease reading'.

All of this prepared for the advent of a new epoch, the Age of Enlightenment. It was associated, in the first place, with the leaders of European thought and culture: Locke, Montesquieu, Descartes, Pascal, Voltaire, Diderot, Rousseau, etc. We could go on with

this constellation of great names, but the most ponderous contribution to the school of modern science was made by Francis Bacon. He penned a number of outstanding works explaining the idea of the Great Resurrection of Sciences, which laid the foundation, as I see it, for the scientific, technological and information revolutions of the future.

The great saga of human knowledge contains pages that are unique, and I would list first among them those which contain examples combining the potentials of the human mind and technology. Of course, tools, instruments and machines have long been used by man to accomplish practical tasks. The new times, however, required new machines. Human beings fully realized how difficult it is to undertake construction, pursue scientific research and handle commercial trade deals relying simply on the resources of the human mind, which, in addition, was extremely unreliable as a 'databank'. Death broke the threads of life and relegated to the abysmal realm of Hades many discoveries of great value, such that the secrets of ancient masters could easily have been irretrievably lost. It was probably from the time of Daedalus and Hero of Alexandria, who sought to design machines with functions similar to those of living things, from the 'ring of Pascal', as his contemporaries called his calculating machine, from the adding and multiplication machine of Leibnitz that the first faltering steps were taken towards the modern world of computers. The entire further history of human activity is inseparably linked with the development of means of selection, storage and transmission of information. The invention of the typewriter, telephone, telegraph, radio, dictaphone, television, computer, and the modern means of overland and space communication are all stages in the triumph of the information age. One has the impression that all peoples have adopted Norbert Wiener's contention to the effect that to live a real life means to live and have accurate information.

The technogenic age

But what does information mean today?

This concerns an enormous area of scientific knowledge associated with the reception, storage, processing, transmission and use of information.

Just as with the majority of sciences, in informatics it is possible, in highly conventional terms it is true (since this is connected with the study and use of one and the same object—information), to identify two major directions: theoretical informatics and applied informatics.

In accordance with the modern conception of the structure of informatics, theoretical informatics, which is a mathematical discipline, makes broad use of mathematical modeling methods to process, transmit and use information, thereby laying the foundation on which the whole edifice of information processing rests.

Applied informatics presents an enormous choice of computerized means, including: information technology, networks, communication and telecommunication systems, audio and video systems, multimedia systems, programme software, and information media. Applied informatics is usually regarded as incorporating information technologies in the training, design and management of projects, processes and systems.

The development of modern computerized methods has allowed them to step boldly into the sphere of education and scientific research. It is precisely with the computeriza-

tion of education that we associate today the realistic potentials of building an open system allowing every person to choose his or her own path through education. This represents a radical change in the technology for obtaining new knowledge by means of a more efficient organization of the cognitive activity of students in the educational process on the basis of an important didactic property of the computer, the individualization of learning while preserving its integrity by programming and the dynamic adaptation of automated educational curricula.

Totally new opportunities for teachers and students have been opened up by telecommunication technologies containing global telecommunication networks and intellectual computer systems. The unification of such systems and networks already today provides the basis for a new planetary infrastructure: the infosphere.

It is hard to overestimate the influence computers have had on progress in practically all sciences. They have not only multiplied the possibilities for obtaining ever more complete knowledge about subject matter, but have also brought about the need for developing a new philosophy of scientific research.

The large scope of the processes which are taking place in information technologies at this turn of the century, their growing role in forming the image of the present and future of mankind, lead us to search for similar examples in the century that is closing. Looking back and assessing all the achievements of the present century, I shall venture to single out one main thing: the concept of relativity laid down by Albert Einstein, Sigmund Freud and Karl Marx in the material, spiritual and social worlds. Their brilliant insights gave mankind the possibility of realizing that the world is not what it appears to be, that we cannot trust the empirical perception of the concepts of space and time, good and evil, law and justice, and the nature of human behaviour in society. They gave back to people an awareness of the fact that concepts and laws reflect not only the objective reality of the material world but also the social world, of which Thomas Hobbes remarked as far back as the seventeenth century that 'all social laws of the state must obey the same rules as mechanics and geometry'. A violation of any of these principles inevitably leads to catastrophe. Unfortunately, the past year has given us quite a few examples of how these fundamental truths have been overlooked, causing irreparable harm to nature, the world of living things and mankind himself.

The turning point between the two millennia is drawing closer. We shall soon see behind us the twentieth century, which has shown the world features of a new civilization never before known. Man has made a breakthrough into outer space, descended far into the ocean depths, designed sophisticated machines, harnessed thermonuclear energy and become its hostage, learned to use the wealth of nature on an unprecedented scale, but succeeded to a lesser extent in healing the wounds caused to nature.

Indeed, what is happening in our period of the technogenic culture of mankind's development? According to the estimates of paleontologists, during all the time that life has evolved on earth until the advent of mankind about 500 species of animal and vegetable organisms became entirely extinct. But today their number is about 2 million. As a result of deforestation alone, the total loss adds up to between 4,000 and 6,000 species per year. This is roughly 10,000 times the natural rate of their extinction before the advent of man. Simultaneously, the planet is actively 'colonized' by members of what may be

called a 'technical population'. Today, about 15 to 20 million types of different machines, technical instruments, devices and structures augment the size of this 'population' every year.

Towards a universal model

Man has proved ill-adapted to this new era in the development of civilization. This did not happen just today but first began to appear somewhere in the 1930s and 1940s, when some of the outlines of the coming scientific and technological revolution in energy, space and information appeared on the horizon. The Spanish philosopher Ortega y Gasset noted this in 1930 when he wrote: 'Today catastrophe is visiting man himself who has become incapable of keeping pace with his civilization. An expanding civilization is nothing less than a painful problem. The greater the achievements, the greater the dangers to civilization.'

Since then, some sixty years later, that contention has been corroborated hundreds and thousands of times. Our knowledge is becoming a 'Pandora's box' of its own kind, from which many ills escape into the world. The new methods of agriculture have caused 'green revolutions' which cannot be sustained without enormous applications of chemicals. The growth in the needs of modern man has given birth to a gigantic consumer industry, this Leviathan devouring everything without respite. Natural resources are being consumed, dug out, landed as catch and destroyed with monstrous intensity. The power industry has become an inevitable companion to any developed country. It has caused a number of disasters which may well end up in a worldwide catastrophe. The indefatigable efforts of the best scientists have been unable to protect the world from AIDS, epidemics, alcoholism and drug addiction.

All this is evidence of an absolutely unsatisfactory state of public morals, educational philosophy and industrial technological practices. Society has, in fact, reconciled itself to the existence of a 'unidimensional man', trained for one vocation with a narrow, lop-sided world outlook. Differentiation and socialization allegedly dictated by the logic of scientific progress are, in fact, pushing the world to the brink of catastrophe. Individual representatives of culture or of the ecological movement are often quite helpless in their efforts to curb the instincts of the crowd clinging to a comfortable way of life.

In this context, it becomes obvious that the entire system of knowledge about the world, man and society must be exposed to an agonizing re-evaluation. We must certainly return, although at a higher level on the spiral of development, to an integral knowledge, philosophy and uniform order of the universe. In other words, to a fundamentalization of education on the basis of the organic unity of its natural science and humanitarian components. It is imperative to bring the entire aggregate of knowledge, religious faiths, cultures and technologies to a unity not rejected by the world and man. It would be wise to begin by developing a universal model of a harmonious world. Mankind must grasp this interrelationship with the surrounding world scientifically, visually and materially. The culture of peoples, ecology, computers, the study of countries, the study of religions, mathematics, physics, biology and other subjects must make up a curriculum of knowledge for a universal being, whose actions will have the aim and purport of achiev-

ing the 'universal knowledge' and the 'integral world' described in his writings by Vladimir Vernadsky. This process must be given priority before it is too late.

Today, as perhaps never before, it is necessary to secure the practical realization of the triad 'ecological upbringing—ecological enlightenment—ecological education'. All parts of this triad are closely interconnected; they constitute the basis for cultivating people's ecological world-outlook based on an awareness of the need to preserve the environment necessary to support mankind's life, which means, in effect, the entire biosphere of the Earth.

No country, however modern and developed its economy, is capable of solving these global problems on its own. It is necessary to unite the economic, intellectual and spiritual potentials of the entire world community.

In my opinion, these problems could be divided into two main groups. The first group refers to global problems in the development of human civilization, which at present are characterized by the existence of a number of grave crises in the fields of the economy, ecology, energy and information, as well as a recent, sharp exacerbation of ethnic and social conflicts in many regions. The possibility of successfully overcoming these crises and conflicts, through a consensus of opinion, is determined to a significant extent today and to a still greater extent in the future primarily by the level of education and culture that each society will achieve. Indeed, already today at the end of the twentieth century the fundamental dependence of our civilization on the quality of the individuals turned out by the education system has become quite evident. This is largely due to the fact that the possibilities of reflection by modern man have assumed truly planetary proportions. They contain unheard-of opportunities and unprecedented hazards. What will prevail in reality will largely depend on education, on schools and universities. It is a risk, but there is also hope!

There is, however, another group of reasons pointing to the need for a fundamentalization of education. They are conditioned by the fact that the development of the world community in the last few decades has been placing more stress on the priority of the individual in education. According to modern concepts, the formation of a broadly educated person requires bringing together a number of interconnected tasks. First, it is imperative to harmonize the relations between man and nature by familiarizing people with a natural science approach to their world and the problems of the biosphere and the world as a whole. People should understand their place in nature and on this basis solve the problems of ecology and, on a broader plane, those of the noosphere. Second, it is imperative to proceed from the assumption that mankind is a social being and, to achieve harmonious socialization, it is necessary for a person to become assimilated by the existing cultural environment through the study of history, law, culture, economics and philosophy. Third, modern man lives in a richly saturated information environment, so one of the tasks facing the education system is to teach people how to survive in this situation, and to use it for continued self-education. Fourth, and last, the human personality must be in accord with itself, which requires a certain amount of knowledge about psychology and physiology, as well as familiarity with literature and the arts. This concept of modern man was forcefully expressed by the poetess S. Dvornik:

The burden of trifling earthly cares is nothing,
Each one bears them up in grief,
But where to find the strength for the heaviest burden,
The burden of one's own self?

Basic education

Thus, the necessity of solving both the global problems of mankind and of meeting the vital needs of each person leads us to the idea of basic education.

The following question seems relevant: 'What must be the basis for this fundamentalization?' Evidently, the basics in science and the basics in education. These concepts have both features in common as well as differences, and the correlation between them has changed throughout history. Initially, the concept of elementary education was formulated by Wilhelm von Humboldt in the early nineteenth century, and implied that the subject of such education must be that basic knowledge which fundamental science precisely at that time was opening up at its frontiers. Moreover, it was assumed that education must be directly integrated into scientific research. In the following 100 years or so this ideal of education was realized in the best universities of the world. In time, however, the rift between the ideal model and reality became more and more evident. The gigantic and ever-increasing mass of knowledge led to the need for it to be adequately structured and reflected in educational disciplines, which eventually turned basic education into an independent and major field of man's intellectual activity.

Therefore, to secure the fundamentality and integrity of education it is necessary first to achieve the same aims in the fundamental sciences themselves, since the differentiation of sciences in the twentieth century has reached such a degree that specialists from different departments of what was formerly a unified science are often unable to understand one another. In recent times, it is true, the situation has been changing, and integration and interdisciplinary trends have been coming to the fore, but the final solution to this problem is still a long way off. Therefore, scientists and educationists are now faced with an immediate task: to identify the core of each of the fundamental sciences, then to reveal the core of natural science as a whole and the entire body of human knowledge and, finally, at the next stage, to evolve the fundamentals of integrated basic education.

The transition to a new educational approach, which is based on the fundamentalization of education, is recognized by all as a pressing necessity; however, how to achieve this transition requires discussion and comprehension.

In my opinion, this transition must not be reduced to a simple increase in the volume of each of the natural sciences and human sciences: an analysis of the existing curricula and syllabuses indicates that the possibilities here have been practically exhausted. It must be a matter of setting qualitatively new aims for education and new principles for the selection and systematization of knowledge, compiling fundamental educational courses in each of the traditional natural and human science disciplines, and their co-ordination with each other to achieve a new quality of education, both for the individual and for society.

One of the key tasks in this new stage of educational development—overcoming the historically developed separation of the components of culture: natural science and the humanities—should be achieved by their mutual enrichment and a search for the foundations of integrated civilized culture. Inclusion of the cycle of general natural science disciplines into humanistic education and vice-versa, the cycle of general humanistic disciplines into natural science and technical education, must be a major element in this process.

The problem of including elements of natural science knowledge into the humanities is especially complicated in view of its novelty. Needless to say, this must not be a conglomeration of fragmentary and oversimplified information arising from different natural sciences. On the contrary, it must consist of integral conceptual courses in mathematics and natural science oriented towards forming elements of rational thinking and ideas about a modern scientific world-outlook adjusted to the mentality of humanists.

This new educational paradigm reflects, in my view, the requirements of human civilization on the threshold of the twenty-first century. The further development of democracy and a free market, the achievement of harmony between the individual and society, while respecting nature at the same time, is possible on the basis of a broad fundamental and integral education capable of meeting the requirements of the individual for change in all spheres of activity throughout his or her lifetime. The advancement of the general standards of education throughout society, the elimination of the one-sided dimension in its psychological principles, will grant society the necessary stability, due tolerance between peoples and genuine freedom of thought and action for each individual. Cicero's wise and profoundly meaningful words will finally come true: 'We are really free when we preserve our ability to reason independently, when necessity does not compel us to defend ideas imposed on and, in a way, prescribed to us.'

In accordance with social and economic circumstances during recent decades, a new solution was found to the contradictions which have always existed between basic education and vocational training. Orientation toward narrow professional fields reflected the need to provide social security for the individual. Today the situation is changing. Real social guarantees are available only to a widely educated person, capable of reorganizing the direction and content of his or her activity flexibly so as to keep pace with changes in technologies or market demands. Narrow vocational training in a specific activity must be gradually withdrawn from the education system and passed on to the world of production and other professional activities.

It would also be relevant to draw attention to the fact that mankind, society, the world community and civilization undergoing the development process manifest more and more clearly their most essential—that is to say fundamental—qualities and features. In this context, it is important to set up such a system and structure of education that would be capable of identifying, following up and introducing into the milieu of the students the latest scientific knowledge concerning these fundamental qualities. Consequently, it must be a question not of securing mastery of all knowledge (because in our age its increase and renovation have assumed such rapid rates that they cannot be assimilated by anyone, despite his or her best intentions), but of focusing attention on mastery of the most essential fundamental, stable and lasting knowledge, which can be found at the foundations of the present scientific picture represented by the world of outer space, the world of

man and society, the world of human civilization and the global fundamental processes taking place within them.

The specifics of this system should also evidently be expressed by the fact that this education must be capable not only of equipping the student with knowledge but also, in view of its steady and rapid renovation in our epoch, of creating the desire for continuous independent assimilation of this knowledge, learning the skills and habits of self-education, an independent and creative approach to knowledge during the full period of the individual's active life. Education should ultimately become such a social institution that it can offer the individual various sets of educational services allowing continuous study, guaranteeing for the mass of the people the possibility of post-university and further education. For this purpose, it is necessary: to diversify the structure of educational programmes, giving each person the possibility of constructing the educational path best suited to his or her educational and professional abilities. It should not be forgotten that the process of learning must give people the joy of acquiring a new understanding of the world, of the meaning of life and of one's own place in it. C.-M. de Talleyrand was right to allege that: 'It would be stark madness, some cruel charity, to want every person to pass through all the stages of education.' From this it follows that, of the major problems of the late twentieth and early twenty-first centuries, the key will be the problem of finding the relevant organizational structure of the education system and its institutions which would secure transition from the principle of 'Educated for a lifetime' to the principle of 'Lifelong education for all'.

The content of education

Finally, guaranteeing this perception of a modern scientific outlook on the world requires innovation in a most important matter: the content of education and its structure. In the educational process, priority should be attached to that scientific knowledge, those means of education, educational technologies and methods, disciplines and courses that are capable of reflecting the fundamentals of the ambivalent process of integration and differentiation in science, using the achievements of cybernetics, synergetics and other fields of knowledge arising at the frontiers of sciences and allowing entry into the systemic level of learning reality, seeing and using the mechanisms of self-organization and self-development of phenomena and processes.

Top priority here must be given to disciplinary and interdisciplinary courses which contain the most fundamental knowledge providing the basis for forming general and vocational culture, and prompt adaptation to new professions and specialties, which are the theoretical basis for the broad development of applied research and development. Consequently, such knowledge, first, must be capable of forming a broad, integral, encyclopedic view of the present world and the place of man in it; second, it should allow subject dissociation and isolation to be overcome. At one time, in the eighteenth century, this was normal and had a progressive character, because it allowed one to master the fundamentals of knowledge at the level of sciences which had already taken shape by that time but which were still standing side by side and had no strong interrelations and interpenetration. Today, this isolation has become an ever more formidable barrier to

evolving an integrated scientific world-outlook and learning the fundamentals of a unified culture in its human and natural sciences aspects.

The adoption of interdisciplinary educational courses and knowledge would allow this dissociation to be overcome, uniting in a joint creative work, both in the educational process and in scientific research, representatives of the natural, technical and human sciences, making them actively involved in the assimilation by students of an integral outlook on the phenomena and processes occurring in the modern world. Thus, we would benefit from the advantages of integrated knowledge coming together at the junction of these sciences and opening the road towards mastery of the fundamentals of a united human culture, harmoniously combining the natural science and humanitarian principles.

At the end of the twentieth century, the trend towards the formation of the world community into a 'global village', the transition of its members from confrontation, 'hot' and 'cold' wars and tensions towards rapprochement and co-operation on many global, regional and interethnic issues is becoming increasingly manifest.

These essential changes in the world community are providing ground for increasingly consistent advancement from national estrangement and self-isolation to interaction and co-operation in the world educational community, as well as a movement towards its formation into an integral whole, taking account of the ethnic specificities determined by the requirements, interests and aims of each country.

Hence the need for pooling our efforts in developing and implementing vocational educational programmes, expanding academic mobility, creating national and regional banks of scientific and educational-methodological information capable of setting up links with world databanks and knowledge resources, and supplying these banks with technologies facilitating access to the world telecommunication networks.

There is yet another crucially important social aspect generated by the development of modern society which merits attention. The entry of society into the post-industrial age sharply raises the status and role of an educated and highly cultured individual, a creative person both in the production and in the non-production spheres. This has been brought about by the fact that, with the existence of the advanced technologies that mankind possesses at the boundary between the twentieth and the twenty-first centuries, their highly productive utilization, let alone their invention and perfection, are possible only if suitably trained highly-skilled workers are available.

Hence the great attention being given today to the individual, to his or her culture, education, the development of his or her creativity and skills, the provision of the appropriate conditions, the democratization of the production and non-production spheres, and the humanization of man's entire way of life. In this context, modern educational development according to humanist and humanitarian principles is becoming its most important feature.

Education in the twenty-first century

On the threshold of the twenty-first century, we are trying to define the main features which will determine education in the coming millennium.

Education for the twenty-first century is called upon to be education for all. As our

civilization continues to advance, people without an education are ousted from the conditions enabling them to live a life worthy of man. Therefore, infringement of the right to education, including its unsatisfactory quality, leads to intellectual and cultural degradation of the individual, which is incompatible with stable development.

Education for the twenty-first century must have ethics at the core of its meaning. This is not only a matter of the need to educate new generations in the spirit of peace, mutual understanding and tolerance. No less imperative, in my view, is environmental education and, on a broader plane, the development in each individual of a global ethic and a global awareness of responsibility as the basic standard for a new humanism, for a new united and integrated world.

Education for the twenty-first century is called upon to have a creative and innovative character. In a world where change has become a feature not only of scientific and technological progress, but also of a way of life for people at large, schools and universities are in duty bound to pass on to future generations knowledge accumulated earlier and to prepare them for the solution of problems that the individual and society have never before been confronted with.

Education for the twenty-first century must be built on scientifically substantiated knowledge. This is the unique condition for forming individuals possessing knowledge and capable of theoretical and critical thinking. In an education system where science is subjected to ideology, manipulative pedagogical technology and narrow pragmatism there is the very serious danger that the individual will be deformed, turning him or her into a blind functionary who has practical skills but no ability to think—and who is hence irresponsible.

Finally, education for the twenty-first century must be multiform, satisfying the cultural and ethnic diversity of mankind and meeting the all-round requirements of social, professional and confessional groups, as well as individual spiritual requirements.

In a situation where information is snowballing into an avalanche, the principles of knowledge selection and systematization become highly important. For this we have to seek new ways of synthesizing them and, perhaps once again, we should draw upon the great ideas of Encyclopaedism. The answer to these questions cannot be simple and unequivocal. It will take time to discuss and comprehend them.

I hope that in the twenty-first century in the field of international co-operation the value imperatives will be linked with the formation of a common educational space, of which C.-M. de Talleyrand spoke almost two centuries ago, justly alleging that: 'Education is, indeed, a special power, whose field of influence cannot be determined by anyone, and even national power is not in a position to set its limits: the sphere of its influence is enormous, endless . . .'.

Today this special power is showing the world lofty examples of its 'state' organization, where irreconcilable contradictions and the furious heat of passions are resolved not by the force of arms but by the force of the intellect.

Notes

1. This is a slightly edited version of a paper presented at the second International Congress of UNESCO on Education and Informatics: Educational Policies and New Technologies, Moscow, 1-5 July 1996.

2. Together with Comenius, several educators mentioned in this article, such as Aristotle, Freud, Humboldt, Locke, Ortega y Gasset and Rousseau, appear in the 'Thinkers on education' series of *Prospects* (four double issues: nos. 85–86, 87–88, 89–90 and 91–92, which were published in 1993 and 1994).

THE PENETRATION OF NEW TECHNOLOGIES INTO DEVELOPING COUNTRIES: CULTURAL HEGEMONY OR MUTUAL EXCHANGE?[1]

P.A. Motsoaledi

Introduction

The presence of a representative from the Republic of South Africa at an international conference[1] signals the re-entry of our country into the fold of nations. This is particularly significant because I am from one of the poorest provinces of our country where the legacy of *apartheid* has left a trail of suffering, poverty, ignorance and death.

Although we are new in the business of reconstructing a country, we are faced with a passionate expectation from our people, from the African continent and from the international community to bring into existence solutions that will remove this legacy speedily and serviceably. In doing so, we are determined to employ combinations of approaches that have been used by other countries, with the careful scrutiny that ensures that the context of our country in not disregarded. The use of new information technologies is one of the measures we are keenly focusing on. Before one can delve into that, this conference needs to be appraised of the situation that prevails in South Africa after forty years of *apartheid* rule and 300 years of colonial subjugation.

To illustrate that point, I will describe the situation of education in my country in

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Original language: English

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general and in my province in particular. It is a story of searing poverty and degradation, and a story of sterling resistance and fortitude. The architects of the *apartheid* system had an obscene, if not blasphemous, strategic vision. They set out to destroy the brain, the mind and the very soul of our people. South Africa will suffer for many years to come with the legacy of 'Bantu education'—arguably one of the most successful and pernicious educational interventions and social engineering constructs of the twentieth century. Its designer, H.F. Verwoerd—himself the architect of 'Grande Apartheid'—stated categorically that no black person should ever be educated to a level where he or she became anything above a menial labourer. The consequences of this legislative imposition led to a concerted policy of statutory neglect of educational provision for black people on the one hand, and a progressive dismantling of all semblance of quality schooling which had existed on the other. The church schools and, in particular, the Catholic schools run by nuns and monks, fell into the latter category.

Little State provision was made to keep pace with the burgeoning numbers of black children through the 1960s, 1970s and 1980s. While there was some effort in the late 1980s to reverse this trend, the damage had been done. Black education, even after two years of democratic rule, remains characterized by:

- complete underprovision of resources such as classrooms, libraries, laboratory equipment, etc.;
- poorly-trained and underqualified teachers, lacking in motivation;
- the absence of science, mathematics and technology, and the paralysing fear which our people experience whenever these subjects are mentioned;
- poor school-leaving results after twelve years of continuous schooling;
- poor success rates at tertiary level;
- complete inefficiency in the expenditure of available resources.

You might have heard about Bantu education under *apartheid,* but you have not seen or understood it until you hear the story of the Northern Province of South Africa.

When we took power in April 1994 and I was appointed Minister, I thought that in the first five years of our new government I would be able to do away with at least the most grotesque scars of Bantu education. Two years down the line to date, I have gone only as far as to begin to understand the depth of the problems of education in my province. It is an intricately woven bequest of oppression.

The most visible is the absence of physical facilities. The *apartheid* government's grand twin to Bantu education was the 'Bantustans', alternatively known as the 'homelands'. These were areas which were demarcated to be given to our people whenever they clamoured for freedom. There were ten of them and they occupied a total of only 13% of the whole of South Africa. The most common characteristic among them was the way they were demarcated: all of them were barren pieces of land with no means to sustain life.

Since they were to be for people who are 'free' or 'self governing', the *apartheid* regime argued that the people who lived there would take charge of their own affairs, including the building of schools, using their own resources. Now, when you first ensure that you put a person in a place with no resources and then turn around to say 'use your own resources to build schools', what will be the result? The result will be no schools. The whole of South Africa is short of 60,000 classrooms. Of these 60,000, 35,000 are needed

in the Northern Province, if we are to avoid having our children attend classes in the dilapidated structures we have inherited.

Students were promoted from class to class regardless of their achievement, until they arrived at the externally set matriculation exam—and this is where the trouble started. Failing the matriculation examination is a general norm in my province. Last year 76% of those reaching Standard 10 failed the exam, a total of about 80,000 students. More than a quarter of all candidates for the exam in South Africa come from the Northern Province. Among them are a significant number who have been stuck at this level for four, five, six or even more years.

The performance of those that do obtain a pass is far below the standards required for acceptance into tertiary institutions. Since this had been going on over many years, there was an accumulation of students who had left school and had nowhere to go. To solve this problem, the 'Bantustans' started setting up a myriad of teacher-training colleges which could accept these students with poor results. They continued doing this until 1994, when the number of teacher-training colleges stood at unacceptably high levels, unacceptable even by the standards of 'Bantu education' itself. These colleges had been churning out inappropriately qualified teachers who far exceeded the demand.

But these are not our only problems. Another legacy is mal-administration. By the time we took over power, inefficiency, truancy, corruption, sloppiness and laziness had become the work ethic. In our province this is especially significant because we have had to integrate three 'Bantustans' into the new provincial government.

From time to time, countries are forced to declare disaster areas after freak phenomena like earthquakes, storms and floods, drought and epidemic outbreaks. When such declarations are made, the whole country and the world are mobilized to provide assistance. Deputy-President Thabo Mbeki visited our schools early in 1996. During that visit, he did a most unusual thing: he declared our province to be an educational disaster area. Perhaps we are the only province in the whole world where the president of a country found it appropriate to declare an area as experiencing a disaster in education.

Where does the use of technology come in?

What I have just outlined is surely a disaster in human development. To redress this disaster, we have to be even more sophisticated than those perpetrators who conjured up this inhuman tapestry. We are fervent in our conviction that a mixture of cutting-edge technology and committed politicians, administrators and civil servants will make the Northern Province an example of educational reconstruction.

There are fears that an unchecked introduction of technology could alienate people in underdeveloped countries from their own cultures. We would argue that, if this happens, it will not be because of technological advances. Rather, it will be because of the wrong policies adopted by politicians. Let me illustrate what I mean. In my province there are six indigenous languages, yet only two appeared on TV in any form, whether as news, discussion programmes, theatre, etc. And this, of course, did have the effect of alienating the people from their own cultures because they then regarded themselves and their cultures as unimportant. But as you can see, we wish to emphasize that this was not because

of technology, but a deliberate political exclusion of particular groups of people within South Africa from the benefits that modern technology can bring.

Indeed, since the demise of *apartheid*, the reconstruction of the South African Broadcasting System has brought these alienated communities on board. And it is interesting to note that people are now using technology to display cultures which were presumed to be long dead under colonial rule. This shows that our indigenous cultures are particularly resilient, and it further suggests that, had we not been excluded from mainstream technology, our cultures might have flourished more than they do now. Indeed, we are afraid that further exclusion from the mainstream world technologies might tend to render these cultures extinct. So we believe that the important thing is to make sure that appropriate technology is introduced in an equitable manner at an appropriate pace.

For example, it is relatively easy and tempting to continue to provide education of some quality in well-resourced urban environments, as was the practice under *apartheid* in South Africa. There was more and more reluctance, however, to move into impoverished black townships and rural environments. Again, this was no fault of technology itself—technology is culturally neutral—problems arise in the way that technology is used by people. It is essential that any technology programme focuses on these intransigent educational problems, rather than simply expanding the privileges of the elite.

In my province, there are several main thrusts we are concentrating on:

- the shift of paradigms towards a more learner-centred instructional methodology and re-orienting our education system away from 'Bantu education';
- improving the quality of our teachers;
- bringing the teaching and learning of mathematics, science and technology to the forefront of the whole educational process;
- modernizing management systems and reshaping our human resources to be in line with advanced and scientific approaches;
- improving material resources and facilities in the entire system.

In all these thrusts, the strategy will be to rely heavily on the employment of new information technologies (NITs). This is especially urgent as it is becoming more and more apparent that the present educators can no longer cope with the increasing volume of people—children and adults—whom we would like to educate. And this situation is most urgent in the rural areas, and specifically in my province where the human resources development index is the lowest in the country; we have to rely on technology to enhance the effectiveness of the relatively small pool of educators.

Teacher education

At the beginning of this year, we took a radical step and discontinued first-year intake into two-thirds of our colleges of education. Our intention is to gradually turn these rationalized institutions into technical schools, technicons and other facilities which can produce resources needed by the economy. The unemployment figure in my province is the highest in the country—47%. Already in ten of these colleges, we are running a mathematics and science bridging programme aimed at assisting students who have passed Standard 10, but whose performance falls below what is required in tertiary institutions or techni-

cal employment. Through the extensive use of technology, these students will be leapfrogged into the modern world.

Apartheid education made an all-out effort to ensure that the black population was kept as far away from science and technology as possible. This is in keeping with the Verwoerd statement in Parliament in 1953 during the debate on 'Bantu education' that 'there is no need to teach a "Bantu" child science and mathematics, because the government will not allow him or her to use it'.

We see it as our duty to reverse this destructive policy which has proved so successful in the past forty years. To this end, we have developed the concept of a Mathematics, Science and Technology Education College (MASTEC) whose aim is to improve the quality of education in these fields and to foster an atmosphere of excellence. This college will be dedicated to the production of higher quality mathematics, science and technology teachers. MASTEC will pioneer an innovative approach to teacher training where teacher-trainees will be taught in the way we want them to teach their students. Pedagogy and subject content acquisition will be highly integrated; school experience will start in the first year of the student-teachers' training and continue through all four years. They will work on projects designed to provide hands-on experiences that can form the basis of their own learning, and inform the way they will conduct their classes. Co-operative group work and brain-storming class discussions will provide these teacher-trainees with the opportunity to master the language of science and acquire scientific skills.

And all this will take place in a computer-rich environment, where technology, such as microcomputer-based laboratories, will enhance the acquisition of physics concepts, and where productivity tools, such as word processors, spreadsheets and database software, will bring students into the twenty-first century.

Educational management

To create an effective decision-support system, it will be necessary to integrate data about different racial and tribal groups which were held in disparate databases, in keeping with the then official policy of segregation. Not only is there a problem of technical incompatibility, but we are also confronted with political extremism among officials in charge of these databases, who owed allegiance to the old regime. Since data leads to empowering information, it is not surprising that this gave rise to gatekeepers of all sorts—a clear example of how technological dependence could lead to the worst form of oppression.

The approach we are adopting, under the auspices of the Independent Development Trust (IDT)—the largest NGO in the country—is to develop what we are calling an Education Management Information System (EMIS) that meets the basic requirements of a computerized data-processing system. This entails the gathering of inputs, processing them and producing outputs. In addition, those who had historically been excluded from the process of information gathering and evaluation will be slowly empowered to become information workers in their own right. Another obvious improvement is the time taken before the processed results are available. Previously, this was twelve to eighteen months; with this new approach, it will take a maximum of one month. For people who take technology for granted, this might not mean very much. But, for my people in a rural province,

this represents a great revolution in both cultural and economic terms.

Previously a newly employed teacher could wait up to six months before getting his or her first pay cheque! In fact, I must confess that when I was young, I thought this was a natural phenomenon, because I was born into a family of teachers for whom this was a regular feature of life. Imagine what excitement will be created when people get their pay cheques on time!

The main elements for implementing this approach would be:

- training the lower-level management in the Education Ministry to be computer literate;
- installing computers in all the remote offices and networking these with simple dial-up telephone lines;
- developing software to support this distributed model of computing (shifting from centralized mainframes to separate PCs);
- producing sophisticated decision-support systems for all levels of educational management.

To achieve these objectives, it is obvious that massive resources will be required. The IDT and 'REACH and TEACH' (another prominent NGO), in partnership with my province, have set about developing a framework for co-operation to achieve these goals.

REACH and TEACH has been given the task of setting up the infrastructure aspects of this assignment—the installation of computers at far-flung rural (circuit) and area offices, as well as supplying the training in basic computer literacy. This has involved some novel approaches, since many areas do not have electricity. The use of solar panels for this purpose has been tested and found to work effectively. In areas where no telephone communications exist, the option of using either satellite or high-frequency radio telephones is being investigated. In this way, we will reverse the marginalization experienced by these communities.

The consultants from IDT have asked to develop the software to split the workload of collecting and assimilating the data between the remote sites and the head office. The first phase of this development will be a system to complete the 'Annual return of schools' data at the remote circuit offices. With a sophisticated communications network in place, a steady two-way stream of information can be maintained. This would be particularly useful for future requirements in the tighter control of school provisioning, textbook deliveries at remote offices, etc. Again, for people who take technology for granted, this might not seem very significant, but gross inefficiency brought about by lack of information on, for instance, how many textbooks are needed, will make this particular change seem like another revolution to the education department in my province.

A government committee to oversee the implementation of EMIS has been established. The installation of computers at the various offices is on-going, networked with modem access and e-mail. A training programme is being finalized and many officials will receive such training before the end of August 1996. During late August or early September 1996, the entire province will be involved with a data-capture exercise to record all the schools' enrolment data.

It is the intention of my ministry that the means to address the most marginalized of communities must be the most modern technology. Thus, in a rural area like the Northern

Province we will be using computers running on power supplied by solar panels and in the near future communicating via satellite links. What appears on the surface to be almost anomalous, we intend to make the norm.

Computers in the classroom

The consistent use of technology throughout the administration will make it much easier to introduce computers into classrooms. In so doing, it also becomes possible to use the technology to change the existing approach and apply a more learner-centred instructional methodology in a resource-based learning environment. Seymour Papert (see also this issue of *Prospects*), in a recent book called *The children's machine*, writes about the intransigence of education systems to change. He indicates that the school operating today does so in very much the same way as it did some fifty years ago and this, in spite of the tremendous amount of technological innovation that has taken place.

There are a number of well-established principles for reforming education that are known internationally. These include the following:

1. Changes need to be both top-down and bottom-up. This implies that both the bureaucracy which manages education and the school itself need to be involved in any kind of reform agenda. The time is clearly ripe in South Africa for something of this nature to happen, given the fact that we are one of the few countries in the world where a total restructuring of the educational bureaucracy is at present underway while, at the same time, there is tremendous disaffection at grassroots level with the quality of education delivered by the schools.
2. It is essential to view the school as the entity for reform. This implies that:
   - there must be proper structures for governance which create community involvement with the school;
   - all parts of the school need to be involved in the reform. This is not something for teachers or for children alone, but concerns the entire school—from the principal through to the pupils—who need to be involved and to share. This implies also a mutually-shared vision for the school.
3. It is essential to create a learning environment that supports effective teaching and learning. This in its turn implies:
   - a programme of training principals and their deputies in the methods of school management, as well as equipping them to support the educational changes being introduced;
   - the creation of a resource-based learning environment so that the teacher is not the only resource available, but that small-group interactions become an integral part of the learning environment within the classroom;
   - within this environment it is essential to integrate technology and, in particular, computers and multimedia to support learning.

To actualize a programme of this nature it is essential to establish an infrastructure which can support it. The essence of the programme in the Northern Province is to establish educational resource centres (ERCs) which can serve as the motor driving the educational reconstruction process. It is envisaged that these centres will not be the only administra-

tive home of the programme, but also places at which high-tech equipment, such as computers and other multimedia, can be placed. The ERCs will be used to train teachers throughout the province in the use of this methodology which, at the same time, will enable them to become computer-literate. Each ERC will thus form a hub of educational activity for the schools surrounding it.

Finally, a major problem which has confronted the Northern Province is the one mentioned above about students who repeat their school-leaving examination at Standard-10 level many times. At the end of 1995, the ministry took decisive action to remove many of these students from the former schooling system. This was essential to prevent them from clogging up the system and presenting a blockage to further educational reforms within the schools. All of these students were offered the opportunity of what have now come to be called 'finishing schools', which presently house some 30,000 pupils. Clearly, if they are taught in the same way as in the past, then their success rate will again be minimal. So, together with the IDT and REACH and TEACH, the ministry is planning to mount a programme to use technology within some of these finishing classrooms to help those who, in particular, are attempting to pass the examination in physical sciences, biology and mathematics.

* * *

In conclusion, I trust that you now have gathered some insight into the problems that we are confronted with in my country in general and in my province in particular, and our plans for using the new information technologies to address these problems. I hope that, before long, I will be able to declare that education in my province is no longer a disaster area—this can only be achieved with the support and help from all who attach importance to nurturing the new democracy which South Africa is today.

I hope I have made it clear that the penetration of technology in developing countries may not be a cultural hegemony. In fact, we are having discussions with representatives from various countries who wish to connect their schools with schools in my province, so that students from the Russian Federation, South Africa, the United States and elsewhere can learn from each other, thus forming the nucleus of a mutual cultural exchange.

Note

1. This is a slightly edited version of a paper presented at the second International Congress of UNESCO on Education and Informatics: Educational Policies and New Technologies, Moscow, 1-5 July 1996.

NEW INFORMATION TECHNOLOGIES: INTERNATIONAL CO-OPERATION FROM THE GERMAN POINT OF VIEW[1]

Heinz-Werner Poelchau

Social, economic and cultural issues

The following comments are made from the point of view of a representative of an industrialized nation. It should therefore be kept in mind that the views of other countries may not be considered. I will, nevertheless, try not to place too much emphasis on a narrow German viewpoint, but will instead present a few aspects about the international situation and draw some conclusions from my perspective.

It seems to me to be appropriate for the topic to be placed in a wider context, followed by a discussion of concrete action undertaken in Germany. I will conclude by turning attention to the question of which policies UNESCO might offer its Member States, that is to say, what kinds of reciprocal exchanges in which areas would be in the best interests of all.

Even ten years ago, a director of the IBM company described developments in the area of information technology in the following terms: the flow of information from North America to Europe a few years ago was the equivalent of sending a Jumbo jet at 800 kilo-

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metres per hour over the Atlantic; nowadays, one could send the same amount of information at many times the speed of sound in a mode of transport the size of a fly. If, today in the mid-1990s, one wished to continue this analogy, then the form of transport could only be seen under a microscope and its velocity would come close to that of the speed of light.

This picture of increasing rates of development is closely connected with the growth of knowledge in our world. More than half of all of the scientists that ever lived are living today and the length of time that their scientific developments are valid—or go out of date and are superseded—has been reduced to a time span of between three to five years.

On the other hand, the ability for man to come to terms with and understand this new knowledge has remained practically unchanged. I know of no medical research demonstrating that man's brain has become noticeably bigger or that the speed of comprehension has increased. And, sadly, one must also take into account that there have never been so many wars in the world as since the Second World War, that people die daily from hunger on this Earth, and that damage to the environment has never before been witnessed on such a scale.

The challenges for politics (and in particular for educational policies) which follow from this multi-faceted development in technology on the one hand and society on the other have yet to be comprehensively answered. It is important not to dwell on technological problems and possibilities but rather on the needs of society and to ask whether new technologies can provide solutions—and if so, in what ways. Obviously, it is not possible here to discuss all of the world's problems, but only those which can be solved with the help of these new technologies.

Peace, freedom, social equality and personal well-being are without doubt some of the principal ideals for which all people and nations strive. Important foundations for the fulfilment of these aims are: understanding between peoples; the safeguarding of nutritional resources; the development of well-being; the economic prosperity of nations; and the potential for the individual to develop him/herself.

Much effort has already been put into all of these areas; striving for the development, intensification and consolidation of this work is—and remains—the central task shaping our future. Here, information and communication technologies can and must perform a central role, if we are to go beyond simple economic or technological considerations.

It seems clear that the new information and communication technologies can perform the task of teaching knowledge and understanding very well, because they can convey information and opinions worldwide quickly and efficiently. However, the main document of UNESCO's second International Congress on Education and Informatics points out that these technologies and the information they carry are a product of Western thought. Hence, the contents of this information does not necessarily correspond to the traditions of thought and the cultural heritage of different nations—not to mention the fact that most of the content is in English. Therefore, the flow of information can have a negative influence on the preservation of each nation's culture. New misunderstandings can occur due to the direct confrontation of different cultures, an event which would not have happened without these technologies.

The overall domination of North American, Brazilian, Australian and Japanese films

and video games, which determine the world market, has brought forth not only positive reactions. For example, a quota of European material in the European television schedule has been introduced in an effort to protect the European heritage from North American competition. However, in Europe software is not yet licensed. The production of many software products from Japan and the United States shows, however, that even in the area of digital technology there is an influence on cultural tradition. A considerable impact can be expected on the educational process due to the fact that these products (especially computer games) are aimed, in most cases, at children and young adults. Through this, new divisions might be created between cultures which would work against the possibilities for mutual understanding.

New technologies: closing the gaps

If divisions are already a problem between developed countries, then it can be expected that there is the threat of an even bigger divide between developed and developing countries. To prevent new cases of conflict, close co-operation between countries is of special importance. New technologies can be useful in this quest: new technological possibilities between co-operating parties can extend and intensify this co-operation. This can be achieved without the problems of long and costly teamwork, without undertaking impossible journeys, or even without complicated production techniques.

Inadequate social conditions affecting different countries pose a great challenge—both within countries and between countries. The gap between rich and poor countries in many cases does not seem to be getting any narrower and is even increasing in some places. The reduction of these inequalities must be in the interests of all States and all governments.

In addition to these economically oriented disparities, there are considerable new divergencies which can be best described as the gap between the information-rich and the information-poor. Due to a lack of financial resources and insufficient training, new information technologies cannot be used in the most efficient way. This divide appears less as a problem between developed and developing nations than within a country itself with its attendant difficulties. Remote regions within developed countries experience similar problems to those between developing and developed countries: reduced participation in the development of society, reduced income growth; and even obstacles to overall development—for example, high unemployment.

New information and communication technologies maintain and even strengthen existing imbalances. Of course, it is possible that these technologies could eliminate the imbalances if an opportunity existed for equal access. Previously, information technologies were open to a few, but they are now available to many who allow themselves to work with independent strategies and beliefs. Nevertheless, this requires making it available for all, as well as providing the necessary skills. This, in turn, requires the improvement and further development of general training.

These new technologies are as much a challenge as they are a possible way of overcoming social disparities. They connect nations in previously little-known ways and may thus prevent the gap between the information-rich and the information-poor from

becoming greater, with its consequences. New possibilities of co-operation are emerging which, although arising from different sides, can lead to a mutual goal.

The welfare of the individual is greatly dependent on his or her health and income. Income is necessary for purchasing food and other essential products. Health is dependent on sufficient food and the provision of other necessities. Health is required for the individual to earn an income through his or her own labour. Although new technologies can make the production of the necessary products easier, and can sometimes optimize them, their implementation is dependent on sufficient resources being available to acquire these technologies.

New technologies can contribute to the development of medical care and treatment. For example, they can make essential information for diagnosis and therapy readily available on a large scale. Again, there is a requirement that sufficient financial resources are made available to purchase these technologies and to train the users so that the information is both relevant and useful. For example, access to unlimited data on the Internet is only of use to those who understand how to deal with this information. Another example is satellite television courses about new treatment procedures—courses are only available to those who have installed satellite dishes.

The possible role for new technologies in overcoming these aforementioned problems of health care and the availability of food and other essentials can thus be described as follows: it is conditional on the availability of sufficient financial resources and training opportunities.

New information technologies have an obvious connection with economics. Economies develop through constant adaptation to changing requirements at the national and international levels. New products, methods and trading partners are important vehicles for development—which, in turn, lead to new jobs and sources of income. In this area, new technologies have led to revolutionary changes in recent years, or at least have contributed to their coming about. The position of entire industries has changed due to the new possibilities for development which have been realized—changes in products and in their method of production, as well as the opening of new markets and marketing strategies. The new technologies themselves have been the vehicle for change and have had a significant impact on other technologies.

Concrete German actions

In Germany, estimates show that recently there has been a 50% increase in the number of jobs in the information-processing sector. This information sector is itself a significant market area, and its production and marketing is economically significant.

In North Rhine Westphalia, with its well-known Ruhr area, the European centre of coal and steel, the media sector employs twice as many people as the mining sector, and almost as many as the steel industry. Companies such as Mannesmann have built up large telecommunication enterprises, and more will follow. The change from an industrial society to an information society is in full swing and requires greater efforts from all those involved.

Nevertheless, many challenges connected with this trend need to be mentioned: changes in work organization; the decline in qualifications; the need to provide new types

of qualifications for today's young adults; unemployment; increasing expectations of quality in work and production; increasing competition, etc.

From the above, it follows that new information and communication technologies have had many consequences on general developments in the social sphere. Therefore, a discussion of the effects of these technologies is incomplete if one concentrates only on isolated economic or social areas.

It is to be assumed that the increased use of these technologies will lead to changes in economic and social structures. We can already see these developments taking place. Such changes are reflected in the further development of the social security systems, as well as in questions related to the future workplace, the 'social contribution', the potential for economic competition, new training possibilities, and the future of new organizational structures in government and business.

A number of experts at all levels are preparing papers that imagine new scenarios and possible lines of development. They are attempting to calculate the consequences of further political action and are giving encouragement to various institutions. These groundbreaking actions and their subsequent effects are not only tasks for national organizations and businesses, but are to a greater extent challenges which go beyond national boundaries. They are on the agenda of the European Union and have been given the highest priority.

The consequences of these technologies and the subsequent strategies have a clear impact on the educational sphere: a concentration on one subject or area is just as pointless as restrictions regarding age or even entrance requirements to vocational training. The possibilities and problems of new information and communication technologies can be assessed only by considering the many different aspects. At the same time, this means not only concentrating on making these technologies available, but also on a comprehensive understanding of their potential and problems.

Therefore, in Germany in the mid-1980s we began to give pupils in the first level of secondary education a basic knowledge of information and communication technologies. At the same time, it was ensured that pupils could try out the different practical uses of the new technologies in other subjects. For example, concrete exercises, such as the production of a school newspaper, allow pupils to experience computerized word-processing, as well as to identify and discuss issues concerning copyright. A survey on a subject involving school life provides an opportunity to create tables, to calculate and to present data in graphic form. In addition to the immediate purpose of this teaching, questions of data security and misuse of data could be addressed. Through the use of computer-aided design and computer-aided manufacturing programmes, real products can be created. Of course, other issues must also be considered, such as the impact on employment, reaching agreement with management about employment conditions and other questions regarding the organization of the workplace.

In the compulsory optional section during the first level of secondary education and on the subject of information studies during secondary level two, there is an opportunity for the pupil to widen and deepen his/her basic knowledge. A few months ago, we launched a new project called *Schulen ans Netz* [Schools to the network], which gives schools in Germany the opportunity to test new forms of training and teaching via the Internet. Large German and international firms, as well as state governments, have offered their help with

this process. Within three years, we should be able to build up and firmly establish these opportunities in the schools.

Recently, attitudes towards new technologies have changed so that, increasingly, the whole technology (and not just separate elements of it) has found its way into the classroom. That the skills and the technologies which go along with them have grown together through digitalization confirms this view. This development in the introduction of new technologies gives a glimpse of the possibilities for using and transmitting it, and how this is more important than individual pieces of technology. In this way, the contents of information have expanded alongside the growth of new telecommunication possibilities—such as the Internet—which now connect them together to form a new entity: cyberspace.

Key qualifications

Parallel developments have occurred in vocational training. A few years ago, specific skills were required which young people could use in daily work. Nowadays, the new skills demanded can be better described as *key qualifications*. These skills are available and can be strengthened through general education as well as in specialized training. These general skills include organization and planning, communication, co-operation, mastery of thinking and learning strategies, independence and willingness to assume responsibility in different situations.

This has come about due to the ever-changing challenges which have been placed on the individual in modern working life. One must react flexibly to these challenges—especially since vocational knowledge goes out of date rapidly. The aforementioned key qualifications are essential in order to be able to adapt constantly to the challenges. This is exemplified through Germany's new structure of vocational training for metal and electrical trades. Several hundred training programmes were brought together and general requirements were established. Only then did specialization occur: specialist knowledge was defined and teaching content was established.

Examples from German vocational education

Key qualifications clearly show that the previous division between the roles of general and vocational training have become increasingly vague. There is now little difference between the requirements of basic qualification. Thus, one can understand the attitude that, for persons seeking employment, vocational qualifications carry the same weight and quality as those achieved through general education.

However, this also means that topics must be considered by the vocational field which—although of equal importance—are nevertheless different. As in the broader field of general education, it is important that, when addressing and overcoming general problems concerning projects, the orientation of young people is the end product.

To explain what I mean, I will give five examples which illustrate this assumption.

In a number of vocational schools in Germany a series of projects were completed between 1992 and 1995 under the title of *Integration neuer Technologien in den Unterricht berufsbildener Schulen und Kollegschulen unter besonderer Berücksichtigung der Leitidee*

der sozial- und umweltverträglichen Gestaltung von Arbeit und Technik [The integration of new technologies in vocational schools based on the idea that labour and technology should be adequately adapted to social and environmental aims]. These projects were not overtly concerned with the provision of new technologies, but instead dealt with modern technology as a tool and its comparison with traditional teaching in vocational schools.

THE PRODUCTION ECONOMY

The first project discussed the production, storage, transport and the sale of goods in the face of competition—but it also considered shortages of raw materials and environmental pressures. The goal of this lesson was simultaneously to understand the different types of new technologies and, at the same time, their effects on the individual and on society.

Nowadays, such production systems can only function using modern technologies. In every case, expenditure, prices, delivery times, transport, and production and its requirements were defined utilizing these technologies. In most cases, these analyses occur within the context of the individual company. Such decisions are never—or very rarely—made when national economic or manpower problems threaten.

With the help of scenario techniques and mind-mapping, pupils worked on developing an alternative: an environmentally friendly production economy system. They also discussed the challenges which would face the employees involved in this new system. For example, it was concluded that, although scanner-tills in shops (i.e. using bar-codes) were efficient, it was not possible for the till operator to have an overview of daily income and of the economic position of the company. Thus, it was difficult for them to be aware of their company's success through their own contribution. There was a danger that, due to this lack of an overview, their motivation would suffer.

RE-DESIGNING THE CLASSROOM

In the second project in the same series, young people were asked to re-design their classroom, to give instructions and to draft architectural plans about how the room should be built and equipped. Software programmes available to all helped in drawing up the plans and composing the necessary instructions. In this work, educational and economic questions were central, and the new technologies had an instrumental character. The new technologies also helped in calculating and presenting the results in a most convincing manner.

Besides the vocational skills required to construct a work bench, a drilling machine or other tool, communication skills and a willingness to co-operate were necessary for this task. Of course, reflection on the possibilities of the new technologies was also needed. Thus, it was shown that the available software was suitable to begin working out solutions independently, but it was difficult to develop vocational knowledge and computer skills at a similar rate.

INDEPENDENT RESEARCH AND ANALYSIS

In a third project in northern Germany, self-teaching possibilities were tested with the help of new technologies. The pupils of a vocational training school had the opportunity to

extend their knowledge of the available resources through independent research and analysis. Different technologies and information were available in a separate room. Teaching programmes and courses using personal computers allowed pupils to practise skills and also to research databases.

It is of interest that this teaching centre was not only available to the pupils of the school but also to interested parties outside the school. Thus, a bridge could be built between academic training and further training available outside the school. The teachers in this teaching centre clearly had tasks beyond those of classroom teacher. They were no longer the source of knowledge, but rather the trainer or coach of those who wished to work independently.

Past experience has shown that it is necessary to go beyond a narrow range of databases. Materials must be made available to self-learners who are working on a specific task. To achieve teaching success, business-related help must also be available—for example, foreign-language dictionaries when preparations are made for the manufacture and sale of products abroad. Such connections are required if one is to remain faithful to the goal of vocational training—training that gives general key qualifications.

LEARNING HOW TO LEARN

A fourth project underlines the importance of key qualifications and the role of lifelong education. Learning how to learn is one of the most important qualifications for the future because even as an adult one is required to acquire new knowledge independently. Not only do the many opportunities for vocational and general education offered by chambers of industry and commerce and vocational schools serve this goal, but also the teaching programmes developed by industry and offered to its workers/students.

A very recent example is the computer-aided self-learning programme developed by Siemens, in partnership with the German Ministry of Education and Ministry of Science, Research and Technology. *Lernen in der betrieblichen Praxis* [Learning and working in practice] is an independent study course for trainees which teaches the basic skills of the learning process that can be utilized on the job.

This programme is available entirely on CD-ROM and allows the development of basic skills in each type of formative vocational training. It is interesting to note that not only is specific knowledge offered, but a certificate is awarded after successful completion of the training. The computer checks if the trainee has acquired all of the necessary knowledge and then produces a certificate upon the completion of training.

DISTANCE EDUCATION

A final example shows the numerous uses of new information and communication technologies in the acquisition of knowledge and skills by adults. For more than twenty-five years, public broadcasting, vocational schools, colleges and the Ministry of Education have been working together to give adults a second chance to pass a higher-level school examination. The school qualifications available through the *Telekolleg* are recognized by the state authorities for entrance to a higher education course of study. Radio and tele-

vision stations broadcast several educational programmes daily regarding various school subjects. The students work independently with corresponding written material and (recently) with software which allows them to practise at home. Approximately every two weeks, there is an extended tutorial at an educational establishment where remaining questions can be addressed and discussed. Internet connections among students give the opportunity for open discussion. During the two-year course, examinations are taken step-by-step in a total of thirteen different general and vocational subjects—leading to the award of a qualification. The opportunity to experiment with new technologies is offered in addition to traditional vocational training.

Fifty thousand people have upgraded their school qualifications in this way and have been able to undertake further study. Some of those who have finished *Telekolleg* have become teachers and now teach the new students.

International co-operation

These examples clearly show that Germany has comprehensive experience in the utilization of new technologies in both general and vocational education. Hence, I would like to suggest a few possibilities for working together on an international scale.

It seems to me important to mention the reciprocal exchange of information and resources. This can be done electronically or using the more traditional method of paper documents. It must be ensured that the resources to exchange are not only of use to one culture, but are adapted to the needs and circumstances of partner countries. In this way, new partnerships can be established. Because these new technologies are a domain of international competition, there is the danger that not all information will be made available. This appears to be particularly inappropriate and unfair in the area of education. Those countries which are less-developed require particularly comprehensive support to be able to master the problems of the future. Industrial nations are called upon, within their capabilities, to provide this wide-ranging help.

Establishing clear targets and working towards them heightens the possibility of mutual exchange of ideas and can lead to countries working together to achieve a common goal.

Besides the exchange of information about programmes, the exchange of people with their experience is of utmost importance. In the framework of existing cultural and economic agreements, all possibilities should be grasped and used effectively, thus supporting the exchange of experiences through contact between people. Additionally, bilateral and multilateral meetings are possible and advisable. They should take place on a regular basis and should rely on existing structures. Congresses and conferences and their accompanying exhibitions are especially important because education and business partners can discuss areas of mutual interest.

Such actions seem particularly fruitful when joint training is planned and put into action. On a European scale, the European Union's programmes have already borne fruit. Their implementation by other multilateral communities should be encouraged. Germany has had very good experiences in working together with countries in the Pacific region and is willing to expand this co-operation to other countries and establish new contacts. Joint

projects organized by the government, as well as by non-governmental organizations, are of great importance. Contacts between companies from different countries are possible, especially in the area of vocational training.

In Germany, there is a group of institutions which develops multimedia products for vocational training. They also have multimedia products which could be of great interest and benefit to other countries. Business exchanges, as well as assistance in making and using the products, can be initiated. Educational software in German is tested at one of the institutions. Out of more than 4,000 programmes offered on the German market which were tested, less than eighty could be utilized suitably elsewhere. Both critical views and the testing of results are available and can be made known, and may thus give an impetus for the improvement of these products.

Through international communication facilitated by the Internet, international fora should be set up to deal with the experiences resulting from the use of new technologies. Such fora could be created to begin discussions not only at the level of individual institutions and training programmes but also at the level of those responsible for co-ordinating this co-operation. An initiative from UNESCO in this direction would be welcome.

Nevertheless, it is important to make available the material resources for a wider uptake of new technologies. Governments are asked to use their power to overcome barriers. It would scarcely be thinkable, however, that these great challenges be placed solely in the hands of governments. I am convinced that it is in the interests of national and international organizations and companies to create possibilities (through public/private partnerships) for the people of various countries to play a part in their own development. International organizations and financial institutions can thus contribute through encouragement and programmes so that new possibilities for development can be created.

Note

1. This is a slightly edited version of a paper presented at UNESCO's second International Congress on Education and Informatics: Educational Policies and New Technologies, Moscow, 1–5 July 1996.

THE ROLE OF COMPUTERS IN EDUCATION: ACHIEVEMENT *AND* COMPREHENSION[1]

José Armando Valente

Introduction

In most cases, the educational process is restricted to asking students to perform various activities, which they can or cannot do successfully. However, the fact that they may be able to accomplish these activities does not mean that these students necessarily comprehend what they have done.

The distinction between successful achievement (*savoir faire*) and the comprehension of what is achieved is presented by Piaget (1974). He says that a child is able to do complex actions with success without necessarily comprehending all of the concepts involved in the activity. The passage from the level of achievement to the level of comprehension is done thanks to *the grasp of consciousness*. This passage requires the transformation of action schemes into notions and operations (Piaget, 1976).

The use of computers in education can follow the same pattern. With the computer, the student can do many activities and achieve them successfully. However, depending on the type of software used and the teacher's involvement in the computer activity, the stu-

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dent may or may not understand what she/he has accomplished. This is the case when the student uses a tutorial or multimedia software. The student's action can be reduced to turning the next page of the lesson or choosing among several options presented by the software.

However, when a student programmes the computer to solve a particular task, she he engages in an activity that demands different actions which can create the conditions for comprehending what she/he is doing. The process of programming can be seen as a cycle consisting of description, execution, reflection, debugging and description (Valente, 1994; Valente, 1995*a*).

In this cycle, debugging constitutes a unique opportunity for the student to construct her/his knowledge and to understand what she/he is doing. With the help of the teacher, the cycle can be used to understand about how, when and what makes the construction of knowledge possible; it enables a discussion about 'learning about learning' since the student in the process of looking for information is exercising her/his learning skills; and it raises questions about 'thinking about thinking' since the student can analyze her/his programme in terms of effectiveness of her/his ideas, strategies and problem-solving style.

In this paper I discuss the different types of software used in education and I argue that the activity of programming is an opportunity to engage in the passage from achievement to comprehension. Programming involves certain actions that are essential for the development of important skills which are often not present today in the educational process nor in many types of educational software. This discussion allows us to understand the role of the computer in education, and the role of the teacher and of students in the computer-based learning environment. Also, there are several outcomes from this discussion that can help us to set up more effective teacher-training programmes and educational policies involving computers.

Piaget's view of savoir faire and comprehension

In 1974 Piaget published two books, *La prise de conscience* (translated into English as *The grasp of consciousness*, 1976) and *Réussir et comprendre* (Piaget, 1974), reporting the process by which children and adolescents come to develop what he called 'conceptualized comprehension' of concepts involved in a series of tasks he asked his subjects to perform.

Piaget observed that children can use complex actions to achieve premature success which displays all the characteristics of *savoir faire*. The child can do a particular task but does not comprehend how it was done nor is aware of the concepts used to achieve the task. Piaget also observed that the passage from this practical form of knowledge to thinking is done through the grasp of consciousness, which does not constitute a kind of enlightenment but a level of conceptualization. This level of thinking is reached thanks to a process of transformation of action schemes in notions and operations. Thus, through a series of increasingly complex concept co-ordination the child can move from the level of premature success to a level of conceptualized comprehension.

Piaget showed that the passage from premature success to conceptualization is done in three stages: in the first stage the child neglects all of the elements involved in the task;

in the second stage the child co-ordinates some elements; and in the third the child co-ordinates all of the elements involved in the task. He showed this using several tasks such as constructing objects with a deck of cards, tipping over dominoes arranged in a line, playing with scales, etc. The task of tipping over dominoes is a good example to help us to understand these three different stages.

The child is asked to arrange dominoes in a line such that if one tips over the first domino, this will tip the following and successively will tip the next until all of the dominoes in the line fall over. The task is divided into two parts. In the first part the child plays with two dominoes and tries to predict the interval between the dominoes that will make the first domino knock down the second one. Then the child is asked to arrange all of the dominoes in a line, connecting two points A and B. After the child has constructed the line, the child is asked to predict which dominoes will fall and which will not, and why. Then, she/he is asked to tip the first domino and observe what happens to the line of dominoes. In the second part of the task the child is asked to connect the points A and B using different trajectories. The first is a simple diagonal and for the second trajectory an obstacle, such as a model lake or mountain, is placed between points A and B.

Children about 5 years of age can arrange the dominoes in a line and accomplish the first part of the task with success. However, when playing with the two dominoes these children cannot understand that the distance between the dominoes is an important element in the construction of the sequence of dominoes. They think that what makes the subsequent dominoes fall is how hard they push the first domino or that the dominoes need to be closer to each other, but they cannot make explicit how great the distance must be between the dominoes. In this sense, these children can reach the objective of the task but they are not aware of the role of the distance between dominoes or other concepts involved in the task. Thus, the performance of these children indicated that they are considered to be in the first stage.

The next stage is reached when the child is around 6 years old. This stage is characterized by the fact that the child starts to understand and can articulate the idea that the distance between dominoes must be less than the height of the dominoes. However, they cannot organize the dominoes so as to avoid the obstacle or arrange the dominoes in a diagonal line. Their argument is that it is impossible for the dominoes to be arranged according to a curved or diagonal line.

Thus, these children can co-ordinate the distance element present in the sequence of dominoes but cannot co-ordinate the direction of the dominoes. The passage from stage one to stage two happens because the child, in the process of constructing the sequence of dominoes, observes that if the dominoes are too far apart, one cannot lean on the other or the first domino cannot 'touch' the other one. In this situation the child corrects the distance between the dominoes, and becomes aware that the distance between dominoes has to be such that one has to be able to lean on the other. However, for these children the dominoes have to be parallel to each other and, consequently, the sequence of dominoes can only be in a straight line. The dominoes cannot be arranged one a little to the side of the other so that the sequence can be in the form of a diagonal or a curved line.

Children at the third stage can co-ordinate all of the elements involved in the task: distance, direction and the weight of the domino. They understand that as long as each

domino falls on the subsequent one the sequence of dominoes will fall. They can arrange the dominoes so they will fall in a curved or diagonal line. They also understand that the closer the distance between the dominoes, the faster the sequence will fall; and if the dominoes are very light (made of plastic) the closer they have to be so a domino will 'lean' on the next instead of just touching it.

Besides the sequence of stages, Piaget observed that, first, it is not the object that leads the child to the comprehension stage. It is not the case that a child who comprehends how the domino task works will comprehend how to make a castle using a deck of cards. For each situation the child has to transform the action schemes into notions and operations that are involved in the particular task. Second, Piaget noticed that comprehension is the fruit of the quality of the interaction between the learner and the object. If the child has a chance to play with the objects, to reflect upon the results obtained and to be challenged with new situations, the greater are her/his chances to be aware of the concepts involved and, thus, to reach the level of conceptualized comprehension.

These last two observations are fundamental to understanding the relationship between the learner and the computer in a computer-based learning environment. It is not the software that determines whether the learner will be able to reach the stage of comprehension of the concepts involved in the task but *the quality of the interaction between the learner and the software*. An analysis of the interactions which take place between the learner and various educational software will help us to understand the role of the computer.

Analysis of different educational software

Any attempt to classify the different uses of computers in education is problematic and can result in a very simplistic view of what has been produced in this area. However, it can be an interesting exercise to help us understand the role of the computer and how it can be effective in the process of knowledge construction.

Computers have been used to teach about computers (computer literacy) and to teach practically every subject (teaching through the computer). In computer literacy the students use the computer to learn about programming, computer principles and the implications of computer usage in society. Although the majority of education projects utilizing computers are about computer literacy, certainly this is not the kind of application we want to discuss here.

Teaching through the computer means that the student uses the computer to gain knowledge in a particular area. However, the pedagogical approach used can fall in one of two groups: software that has the characteristics necessary for the child to comprehend the task being developed and software that helps the child to do things but has very few characteristics to help the process of comprehension. Among the software that helps the comprehending process are computer programming languages and multimedia authoring systems. In the other group we have tutorials, drill-and-practice exercises, word processing and the use of multimedia.

TUTORIALS

A tutorial is a type of software in which information is organized according to a particular pedagogical sequence and this information is presented to the learner following this sequence or the learner can choose the information she/he wants to see. In the first situation, the software has the control over the teaching situation and what can be presented to the learner: the learner can change items by simply pushing the ENTER key or the software alters the sequence according to the answers given by the learner. In the second situation, the learner can choose what s/he wants. In general, user-controlled software is organized in a hypermedia fashion and the learner can 'navigate' between items of information.

In both cases, the information available to the learner was previously defined and organized. The learner is restricted to this information and the computer assumes the role of a teaching machine. The interaction between the learner and the computer consists of reading the screen or listening to the information given, advancing through the material by pressing the ENTER key, choosing information with the mouse, and/or answering questions by typing on the keyboard. By observing this behaviour we see that the learner is doing things but we do not have any clue that she/he is understanding what s/he is doing. S/he may be processing all of the information given but we do not have the means to certify that this is the case. One way of having access to the learner's knowledge process is by presenting problem situations in which the learner has to use the information given. Some software tries to do this but, in general, the problem presented verifies that the learner memorized the information given, or requires a direct application of the information given in a very restricted domain. An open-ended problem allowing for more than one type of solution would show the level of concept comprehension, but is very difficult for the computer to correct. This type of evaluation is left to the teacher. Most tutorials are not developed with that intention. Unfortunately the teacher is often unavailable to follow what the student is thinking while using a tutorial.

Thus, I classify tutorials as software that allows the student to achieve a certain task such as go through a lesson or acquire a piece of information but this software has very few features that can contribute to the comprehension process.

PROGRAMMING

When a student programmes a computer, the computer can be seen as a tool with which the student can solve problems. I argue that the programme produced has strategies and a problem-solving style. In this way the student begins to think about her/his own thinking (reflexive abstraction).

The programme the student produces is a description of her/his thinking process. This programme contains important information about the child's knowledge and strategies and thus the student's comprehension of the concepts involved in the task. The execution of this programme can be seen as the execution of the learner's thinking. Running this programme gives us two important ingredients for the comprehension process. First, the computer's feedback is faithful. Since the computer does not add any new infor-

mation or knowledge to the student's programme, any mistake found while running the programme is the product of the student's own thinking. This faithful feedback is extremely important in order for the learner to become aware of what she/he knows, and the kind of information s/he needs to get in order to debug her/his ideas. Second, the computer feedback is immediate. After the student pushes the ENTER key she/he has the results being constructed step by step. The student can confront her/his original ideas with the result obtained on the screen. This comparison constitutes the first step in the reflective and the grasp of consciousness processes. These processes can be enhanced by the programme which is a formal description of the student's thought. If we save all of the different versions of the programme produced by the student we can follow the process by which the student developed the concepts involved.

Thus, if we ask the question 'why do we want computers in education?' the answer is that we want to explore the computer features which contribute to the conceptualization process. These features include the expression of the student's thinking in a formal and precise language, the execution of the student's thinking, and results which are faithful and immediate. These characteristics are present in programming activities and help the student to reach the conceptualized comprehension stage because the student can reflect on her/his actions and ideas. This reflection is the mechanism by which the student becomes conscious of her/his knowledge and thus can transform her/his mental schemes into more complex notions and operations.

However, this process does not happen by just placing a student in front of a computer. The student-computer interaction needs to be mediated by a professional who knows about the Logo[2] ideas, from the computational, pedagogical and psychological points of view. This is the role of the Logo teacher. Also, the student (as a social being) is inserted in a social environment that is constituted locally by peers, and more globally by parents, friends and even her/his community. She/he can use all of these social elements as sources of ideas, knowledge or problems to be solved through the use of the computer.

WORD PROCESSING

When a student is writing a text using a word processor her/his interaction with the computer is mediated by the natural language (mother language) and the commands of the word processor to format the text. Many word processors are simple to use and facilitate the written expression of our thoughts. However, the execution part is very handicapped. The word processor only can execute the format aspect of the text or some aspects of writing style, but they cannot yet execute the content of the text and present feedback in terms of whether the content represents what we mean. Since the computer can only present the result of the format execution, the student can only reflect upon the original ideas about the format in comparison to the result presented. The student can read the text but since the computer cannot execute the text content there is no content result to be compared with the original content idea. Thus, the reflective and debugging activities are possible only in terms of the text format. In order to debug the content, the text needs to be read by another person who can interpret it and provide the student with appropriate feedback in terms of text content.

When using a word processor, reflection on and debugging of the text content is not facilitated by the computer. The computer does not provide the necessary information for the student to be aware of her/his knowledge level and, thus, to reach a more complex level of conceptualized comprehension. In this sense, I classify word processors as software that help the student to accomplish tasks but not to comprehend them. Comprehension only can be accomplished by having someone read the text and provide feedback with which the student can become aware of her/his performance.

Certainly, by having the text in the computer it is much easier to debug it. The text does not need to be rewritten all of the time and this facility can establish a different relationship between the student and the text. However, the fact that the computer cannot execute the text content is a major handicap. We do not have the faithful feedback that we get from programming exercises. The feedback provided by another reader may or may not correspond to the real quality of the text. Without faithful information it is much harder to reach more complex levels of conceptualized comprehension.

MULTIMEDIA

Multimedia capabilities can be explored educationally in two different manners: the use of ready-made multimedia software and the development of multimedia projects by the student through multimedia authoring systems.

When using multimedia software the student selects options that are available in the software. Thus, she/he is not describing her/his thinking but is deciding among several possibilities offered by the software. Once a selection is made, the computer presents the information available and the student can reflect upon it. Based upon this analysis, the student can select other options. This series of selections and going from one topic to the other, constitutes the idea of navigating in the software.

It is true that multimedia software is becoming very interesting and creative, and is exploring an incredible number of possibilities. It is possible for the users to navigate in a broad spectrum of topics as well as to go in depth in these topics. However, the student is always restricted to what the software has available. If a particular software does not have what we want, we have to purchase another software package. 'Navigation' can keep the student very busy for a long period of time. However, very little may be accomplished in terms of comprehension and transformation of the information visited into knowledge that can be applied in a meaningful way. In this sense I classify the use of multimedia software in the category of software that helps the student to acquire information, but not to comprehend what she/he has acquired. In the process of navigating the student can come in contact with an incredible number of different ideas. But if this information is not put into use, there is no way we can be sure that this information will transform or enhance new ways of thinking about a particular subject.

When the student develops a multimedia project through the use of a multimedia authoring system, she/he constructs a sequence of information presented through different media. The student has to select information from the literature or from other software, and may have to programme specific items to be included in the project being developed. Once these items are included in the project the student can reflect upon and debug

them in terms of the quality, depth and meaning of the information made available in her/his software. Constructing multimedia projects provides a chance to pull together information in a coherent manner, analyze information and critique it.

In this sense, the cycle of description, execution, reflection and debugging has particular features. The level of description and execution are not the same as in the programming activity. Authoring systems do not require the student to describe everything s/he is thinking while selecting a particular piece of information or even in which media to present this information. Also, the authoring system does not register the process the student uses to set up the project. Thus, the computer executes the sequence of information and does not execute the information itself. In this sense, multimedia execution is very similar to that of the word processor.

The cycle is in terms of getting the multimedia project to work. In terms of the content, it can be rich or poor depending on how much the student comprehends about the information present in her/his software. She/he may know and comprehend a lot if the subject was worked out, but may know very little if the subject was just copied from one source into the project being developed.

Since multimedia authoring systems do not register the thinking process that goes along with the construction of the multimedia project, it is necessary to complement the product being constructed with some kind of report that describes part of this process. For example, a diary describing what was done, what was discussed in terms of items selected, or what was thought about the items or the strategies in organizing the information as shown in the final project. This report is produced separately from the multimedia project and constitutes a task that adds very little to the real construction of the multimedia project. However, it is possible for the authoring system to have a facility to help the student describe the construction process.

The analysis of these different ways of using the computer shows that in order to be able to construct knowledge and to comprehend what we are doing, computer software needs to have certain characteristics to facilitate description, reflection and debugging activities. Programming languages seem to have most of these characteristics. With other educational software such as tutorials, word processing, and the use and construction of multimedia projects, the computer does not execute the student's thinking process and therefore the computer's feedback is not helpful for the student to comprehend what s/he has done. These findings have several implications in terms of setting up policies for implementing computers in education.

Transforming education

The use of computers to help students accomplish tasks without comprehending what they are doing is a mere informatization of the teaching process we have in our schools today. The possibilities that the computer offers as a tool to help students to learn, to construct knowledge and to comprehend what they do constitute a true revolution of the learning process and a chance to transform schools.

Traditional teaching and the informatization of traditional teaching practices are based upon the transmission of information. In this case, the teacher, as well as the com-

puter, are owners of knowledge and assume that students are empty vases to be filled. The result of this teaching approach is a passive student, without capacity to critique and with a vision of the world according to what was transmitted to her/him. This student will have very little chance to survive in the knowledge-based society we are about to enter. In fact, traditional teaching or the informatization of it produces students that are obsolete.

The knowledge society requires creative individuals with the capability to critique, think, learn about learning, work in a group and know about her/his own potential. This individual will need to have a general vision about different ecological and social problems that concern today's society as well as deep knowledge in specific domains. This requires an individual who is attentive and aware about the changes happening in our society and who has the capability to constantly improve and debug her/his ideas and actions.

Certainly, this new attitude is the fruit of an educational process whose objective is the creation of learning environments in which students can experience and develop these capabilities. This knowledge cannot be transmitted but it has to be constructed and developed by the students. This implies that the schools we know today must be transformed. This transformation is much deeper than simply installing a computer as a new educational resource.

Computers must be inserted in a learning environment that allows the construction of knowledge, comprehension of what the student has done and the development of capabilities that are necessary to function in the knowledge society. Learning a particular subject must be the product of a knowledge constructing process done by the student through the development of projects using the computer as a source of information to solve problems that are significant to the student.

Through the process of solving these problems the student can learn about how to get the new information necessary to be incorporated in the solution (to learn about how to learn); to be critical regarding the results obtained; to develop debugging strategies; and to understand that debugging is the engine that drives learning. In this way students can acquire the capabilities and values necessary for the knowledge society because she/he experiences these capabilities instead of them being transmitted by the teacher.

Teachers also need to be trained to assume the role of facilitator of the student's knowledge construction rather than the transmitter of information to the student. For this, teachers need to be trained in terms of computer technology, educational software, and how to integrate this resource into the respective classroom activities. It must be clear to the teacher when and how to use the computer as a tool to stimulate learning. This type of knowledge needs to be constructed by the teachers and it occurs as they use computers with their students, with support from experts who can help teachers become more effective when using computers with their classrooms. Through this support teachers can improve their capabilities as facilitators of knowledge construction and gradually leave the role of information provider.

The transformation of schools is becoming more and more necessary. The knowledge society we are about to enter will demand that this happens. It is a difficult process. However, if the computer enters the school to only become a device to turn pages of a book electronically or as a resource to fix curriculum content, we will be running the risk of computerizing a school that is already obsolete, fossilizing it definitively.

The same transformation required in schools today is also required in training processes outside, for example in industry. Comprehension is particularly necessary if we want the person completely involved in what s/he is doing: a level of involvement which is required in a modern organization's 'lean' factory.

Industries are going through a major transformation, from the traditional mass production approach to 'lean production' (Womack, Jones & Roos, 1990). The lean approach produces only what the consumers want, the defects are identified during the production process rather than at the end of the assembly line, and the production processes are constantly improved in order to eliminate excesses of time, labour, materials and supervisors. However, it demands several changes that have been hard to incorporate into our society. For example, production will need fewer, but more highly skilled, workers (Mazzone, 1993).

The same educational transformation that is needed in schools is also necessary in job training programmes. Companies, like schools, can benefit from a training programme based on the construction of knowledge and comprehension of what one does. In this sense, there is a need for new and more adequate learning tools to identify problems and absorb technologies. The new production processes demand profound changes in work habits, policies and the behaviour of the company itself. There is a need for learning methods that could motivate comprehension and real assimilation of know-how by employees at all levels.

Conclusion

When we ask educators about why we should have computers in education, we constantly hear that the computer can help or that the computer can facilitate education. The idea that the computer should always facilitate comes from a generalization of the fact that the computer entered our lives to facilitate. The computer made cash machines possible, computers are inside automated devices such as microwaves, video recorders, cars, etc. These are examples in which the existence of the computer made something much easier or made something available that was previously impossible. Thus the same thing should happen to education. The computer should facilitate education, making it much easier for the student to learn, for the teacher to teach, and to organize the administrative part of education.

However, when I analyzed the different uses of computers in education, the conclusion was that the uses that are very similar to traditional teaching practices are the least effective ways of using computers as a tool to promote learning or comprehension. I showed that computers can help the conceptualization process and the development of capabilities that are very important in the knowledge society if they are used as a programming device. In this sense the computer is a complication. The student has to describe to the computer through a computer language all of the steps in the process of problem-solving, and if the results do not correspond to what was desired the student has to get the information, incorporate that into the programme and repeat the cycle of describing, executing, reflecting and debugging her/his ideas. This is hard work. Computers do not facilitate this task in the sense of making problem-solving easier. Computers do not give the solu-

tion of a problem on a 'silver plate' as we would expect from an educational device to facilitate our lives as computers have done, for example, with cash machines.

Throughout this article I argue in favour of comprehension because it allows the student to be better prepared for the knowledge society. However, there is another reason for comprehension that is more closely related to the affective aspect. The effort of creating computer-based learning environments for different populations such as students from regular schools (Valente, 1993), special education (Valente, 1991), street kids (Valente, 1995*b*), teachers (Valente, 1996) and workers from the lean factory (Valente, forthcoming) has shown that when given the opportunity to comprehend what they do, all these individuals experience a feeling of *empowerment*. This is the sensation that they are capable of producing something that they thought was impossible. Moreover, it is a product that they not only have accomplished but they comprehend. They can talk about what they have done and they can show it to other people. It is a product of their minds.

In *Réussir et comprendre* Piaget talks about the same idea in terms of *the direction to the future*. What motivates an individual to comprehend a task is the desire to achieve, in the future, a result that is actually predicted. However, the process of looking for the reasons for one assertion or a phenomenon leads to solutions that will create new problems with new solutions and so forth. This direction to the future oscillates between a determination from the past and openings to unpredictable novelties. But the individual knows that through her/his reasoning s/he will be able to reach a level of conceptualized comprehension. This is reached through reasoning and not through guessing or discovering by chance.

This sense of empowerment and trust in our own capabilities gives us the incentive to keep improving our mental capacities and to debug our actions and ideas. We know that we can reach higher levels of comprehension if we keep thinking about what we do and the way we think. It seems that this feeling of empowerment is missing in our schools. We should do everything possible to bring empowerment into the learning environment and to have the direction to the future. If we think about transforming schools we should aim to have an environment that can provide learners with the experience of empowerment. After that, it is just a matter of time and a question of keeping the environment rich, challenging and stimulating so that any individual can learn about practically anything. This should be the main objective of the school that is compatible with the knowledge society.

Notes

1. This is a slightly edited version of a paper presented at UNESCO's second International Congress on Education and Informatics: Educational Policies and New Technologies, Moscow, 1–5 July 1996.
2. Logo is a computer language developed by Seymour Papert at the Massachusetts Institute of Technology. This language has permitted the implementation of a methodology of using computers in education (logo methodology) in which the students programme the computer and, by so doing, learn about the subject matter involved in the problem being solved.

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TOWARDS GLOBAL WISDOM IN THE ERA OF DIGITALIZATION AND COMMUNICATION[1]

Blagovest Sendov

Introduction

On the eve of the twenty-first century we are facing a dramatic change in the world that might be called *removing the walls*—both in a political and technological sense. The power of the new information and communication technologies (ICTs) is influencing human life and the economy so profoundly we are all becoming learners again, both as individuals and members of (real or virtual) learning communities and learning organizations in a learning society.

Learners need information. They need knowledge to make decisions and act. And they need wisdom to decide, act and take responsibility for the consequences of their actions. We should target our education and training towards building an 'information society' where minds and technology work and learn together in a *global knowledge space.* A global knowledge space provides the ground where *global wisdom* can grow. Today, one of the most important tasks of UNESCO, the European Union (EU), the International Federation for Information Processing (IFIP) and other international organizations is to

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foster global wisdom, to cultivate it and to ensure an appropriate political, social and technological climate for its growth.

An information society built upon global information networks offers new challenges for policy makers, researchers, educators and learners. The European Commission White Paper *Teaching and learning: towards the learning society*, approved by the EU on 29 November 1995, states that tomorrow's society will be a society which invests in knowledge, a society of teaching and learning. The fact that *Learning: the treasure within* (Delors et al., 1996) was published in 1996, at the same time as UNESCO's second International Congress on Education and Informatics and the IFIP World Conference Teleteaching '96 *Practising what we preach* (held during the European Year of Lifelong Learning announced on 2 February 1996 by Commissioner Edith Cresson), shows the concern of UNESCO, the EU and IFIP in bringing about conditions for a worldwide diffusion of a technology-driven educational reform. This reform would enable learners all over the globe to have access to the world's cultural heritage, locally unavailable educational services, expertise and resources.

Information, knowledge and wisdom

The main branches of ICT deal with storing, processing, transmitting and presenting information. The notion of information is as fundamental as the notions of matter and energy. There are purely theoretical and philosophical problems associated with the enormous acceleration of computing power and the capacity of telecommunications.

Information itself always uses some material medium, but it is not identical with its carrier. One of the pillars in the progress of information processing is ensuring a high ratio between the unit of information and the amount of matter needed to carry this information. There has been a tremendous advance in these technologies, based on our knowledge of the structure of matter obtained through the physical sciences. Efforts to develop high-performance computers are connected with attempts to reach the ultimate capacity of the human mind. Today, computers, parallel computing systems and telecommunications are the basic instruments for processing and providing information. They provide the conditions for technology and minds to work together, and the ultimate capacity of this synergetic system could be much greater than the capacity of a single mind. To have a clearer view of how to reach this goal, we need to know more about the different categories and structures of information and how they are represented in the human mind.

Information can have different degrees of structure. Information with the lowest level of structure is called data. Knowledge is usually defined as structured information. At the present moment, we are making tremendous progress in developing instruments for storing, processing and transmitting different forms of information, but the advance in defining and understanding different levels of informational structures is not so rapid. If we compare the development of information sciences and the material sciences, it is obvious that we are only at the beginning of differentiating levels of information structures and the related information sciences.

When trying to understand how a human mind works we might successfully employ the informational metaphor. For instance, information processing theory (Miller, Galanter

& Pribram, 1960) and information pickup theory (Gibson, 1977) have become general theories for human cognition and perception. Other theories look at the human mind as a computer which processes information. There is nothing wrong with comparing the function of the human mind with that of a computer, but it is wrong to believe that the human mind works with the same structures of information as a computer. A deeper understanding of the different levels and categories of information structures will help us to better adapt computers to work with humans.

Information received in the human mind evolves into knowledge. The same information builds different information structures (different knowledge) in each different mind. Although learning is often identified with memorization, *effective learning* is an active process of transforming information into usable and applicable personal knowledge. Wisdom refers to a special quality of information. As knowledge might be expressed by human decisions and actions, wisdom might be expressed by wise decisions and actions. Wisdom is a higher level of information structure than knowledge and we should include this category in our educational objectives.

The recent advances in ICT are related to networked digital multimedia systems. Digital multimedia is the field concerned with the computer-controlled integration of text, graphics, still and moving images, animation, sounds and any other medium where information can be digitally represented, stored, transmitted and processed (Fluckinger, 1995). Digital coding and networking make possible the use of a universal representation of all forms of information, to reproduce this information at low cost and with error-free transactions, to ensure unlimited storage, and to transmit any type of information rapidly to any user at any time. The main scientific and technological advances that made the advent of multimedia systems possible are data networking, higher processing power and memory density of computers, and sophisticated data storage and compression algorithms. Looking at the history of information and communication technologies, we can clearly observe that the main attention of researchers and technologists has gradually moved from hardware to software, then to human/computer interfaces, and now to social issues related to global communication and collaboration.

The school will no longer be the sole—nor even the most attractive—source of information and knowledge (Sendov, 1993). Rapid and unhindered acquisition of knowledge in a pleasant atmosphere will be widely provided by television, radio and, hopefully very soon, by means of the *information superhighway*—Internet, video-phones via existing television, digital and interactive television, multimedia electronic messaging, electronic conferencing (asynchronous or on-line), computer-supported co-operative work systems, pay-per-view digital video programmes on demand, movies on demand, remote group computer games, generalized access to public Internet servers, topical news on demand, teleteaching, teleshopping, telebanking, teleticketing, etc.

Nowadays, individuals and organizations experience an enormous information overload due to the low cost of multimedia information production and distribution and the diversity of available distribution channels. The problem of information overload is being transformed to one of information overkill as filtering such a great volume of information is difficult and only a small amount of information can be transformed into usable knowledge. The competitiveness of individuals and organizations depends to a great extent on

their ability to transform information rapidly into applicable knowledge that can be selectively distributed and used for 'just-in-time' decision-making and learning. Networked multimedia and hypermedia offer new opportunities for facilitating knowledge acquisition by activating more human senses. According to recently reported data, humans retain more than 80% of the information they are exposed to if they see, hear and do at the same time (Davis & Hutchenlocher, 1995). These opportunities could be provided by a new generation of intelligent and highly interactive multimedia and hypermedia learning environments built upon learner-centred educational models. Computer literacy should be extended to encompass multimedia literacy related to the student's abilities to read, write and communicate with digitally encoded materials—texts, graphics, still and moving images, animation and sounds. To make use of the new opportunities offered by ICTs, educators should re-design the education system as a whole. In today's world of powerful instruments to produce and access any kind of information at any time and in any place, the content and structure of knowledge to use this information effectively have to be different from the ones available in today's education system (Sendov, 1993).

New educational reform—reflections on an educational experiment

Between 1979 and 1991, a large-scale educational experiment launched by the Research Group on Education (RGE) was carried out in twenty-nine schools in Bulgaria (Penkov & Sendov, 1985; Sendov et al., 1982). The main philosophy centred around the assumption that, due to the advent of mass-produced microcomputers, the education system should be reformed as a whole. This study considered the subject of education as not simply the student, but a student equipped with a microcomputer. The student's capabilities and the machine power should complement each other (Sendov, 1989). When the educational principle of *integration of school subjects* was applied, the students could perceive objects and phenomena in the world from many different aspects and could gain better knowledge and understanding of them. Students solved many problems by looking for answers from a variety of fields of human knowledge. The students took on the role of researchers, who observed, measured, created and revised hypothesis—reaching scientific generalizations and forecasts—the first steps to formal knowledge.

During the classes, different activities were alternated and followed each other in a mosaic that aroused the students' interest. The students learned by themselves from richly illustrated and aesthetically designed textbooks, used a lot of reference materials, solved problems, designed, drew, played, sang and worked on computers. The textbooks attempted to give systematic information as an alternative to the unstructured information from various other channels and media.

The new task of the school was not only to teach but to teach how to learn by oneself. The students were shown that knowledge was infinite, ever-changing, and that nobody could possess it totally (including the teacher). *Learning was defined as an active process.* The principle of non-explicitness was also applied, i.e. the students were not supposed to receive ready-made knowledge, but they were stimulated to discover it in the process of satisfying their natural curiosity. The interaction between students and teachers was

considered as a way to cope with information overload. The teachers and learners were given a greater degree of freedom, but also an increased amount of responsibility.

Informatics and its integration into all school subjects and activities was a powerful way of realizing all of the above-mentioned principles (Nikolov, 1987; Sendov et al., 1982). Informatics interferes with (and in this respect changes) the contents of learning (Sendov, 1989; Sendov et al., 1982). A learning environment in informatics was created as an integrated complex of computer equipment, information resources, educational software, textbooks and other learning materials. Although computer resources were limited, some innovative approaches to school activities were introduced (Nikolov & Sendova, 1988), such as working on projects, collaborative learning, dividing students into different sized groups, collective discussions, experimenting in mathematics, working with databases, language games, publishing a student magazine, software libraries, teaching students in a university laboratory, competitions, a demonstration of students' computer skills, etc.

The described educational experiment might be considered as a model for a computer-driven educational reform. The trial did not substantially change the Bulgarian education system as a whole, because it was not ready for such dramatic change, but the trial gave rise to several educational initiatives and projects in both school and university settings. An exploratory learning environment in geometry (Sendov, Filimonov & Dicheva, 1987) and a set of integrated textbooks on mathematics and informatics for grades 8 to 12 were written in which most of these principles were applied (Sendov et al., 1988–91).

Most of the RGE educational principles are even more valid today and the experience gained could guide us when designing the school of the twenty-first century. The main obstacles in fully achieving the RGE educational goals are the constraints imposed by the traditional print-based schooling system, which relies on a common set of fundamental strategies successfully applied during the last five or six centuries: using textbooks, grouping children primarily by age and secondly by ability, dividing the curriculum into subjects, packaging the subjects into annual instalments, and mapping subjects onto a sequential 'ladder' of levels the students should climb (McClintock, 1992). The basic unit of school space has been the classroom where one teacher teaches about twenty-five students. The basic units of school time have been the school period, school day and school year.

With the advent of networked multimedia and hypermedia, the time has come to reform the existing print-based education system gradually into a ICT-based education system (McClintock, 1992). During the transition from a technology-enriched learning environment to a pedagogical re-engineering of the school (Collis, 1996; Moonen & Collis, 1992), the following main educational principles set out by the RGE might be fully implemented:

- As a subject of education, we could consider not simply a student equipped with a microcomputer, but a student with access to the 'information superhighway' and a member of a global co-operative learning community.
- Instead of integrated textbooks, the principle of integration would be based on using virtual electronic libraries and subject-oriented clearinghouses containing multimedia resources. Through electronic libraries, all educational resource materials will be accessible by students and teachers at any time and any place. The students can learn

by themselves from richly illustrated and aesthetically designed, highly interactive and intelligent multimedia and hypermedia-based courses, initially complimented by textbooks. They would also learn how to search for and retrieve other relevant reference materials. Learning with an electronic library means that the students should optimize their work by navigating through educational resources and taking decisions about what is appropriate and what is not. The subject would include all relevant information which could be found in the local library or in a virtual, networked library.

- Learning to learn and critical thinking are important educational outcomes, not only for the best students, but for everyone studying in a ICT-based education system.
- The interaction between students and teachers, as a way of coping with information overload, would be organized both in a face-to-face manner and by using asynchronous and on-line computer conferences.
- Co-operative learning, as an alternative to competitive learning, would be better realized in a highly interactive (virtual) learning environment comprising computer-supported co-operative learning systems.
- Working on a project would be accepted as an alternative to receiving a lesson and carried out according to the project pedagogy typically applied in university teaching, but only recently transferred to the school level (McClintock, 1992). Networked multimedia communication would enable project teams to work together independently of time and space.
- Teachers would be given a higher degree of freedom as networked applications would allow them to work together across their classrooms and freely share ideas and experiences. Teachers would facilitate students' inquiries, manage their learning processes, and help them navigate in a shared global information space.
- The design principles of the learning environment would be based on asynchronous space and time, responsive environments and virtual reconstruction (McClintock, 1992). By complementing face-to-face and synchronized interactions with a full capacity for asynchronized ones, the physical constraints obstructing one-to-one consultation between a teacher and a student, as well as 'one-to-many' and 'many-to-many' types of discussions, can be significantly lowered. All sorts of new pedagogical groupings may become both feasible and effective. Every student would have her or his own responsive ICT-based learning environment allowing communication with peers, teachers, 'virtual friends', network servers, etc. The virtual reconstruction of school space would enable physically distinct spaces to be joined into virtual auditoriums, workshop rooms, reading rooms, cafes and libraries where students in different locations could interact as if they were together face-to-face. This reconstruction might even reduce the huge capital investment in school buildings.

Towards a learner-centred pedagogy

The main principle in the learner-centred pedagogy is that the learner does not receive ready-made knowledge. The student should discover and construct his or her knowledge—but this does not mean to reinvent it. There are several other important characteristics of this pedagogy:

- The learner participates in the formulation of learning objectives and takes the responsibility for his or her activities. The student is therefore more motivated, self-directed and looking for personal efficiency.
- Student/teacher relations are democratic. The student takes part in formulating the teaching rules and their application (the contract method). The student can even choose his or her teachers.
- Students take initiatives and they are more active than the students in a traditional school setting.
- Students have opportunities to construct their knowledge both in the school setting and outside the school system. The students obtain new knowledge while solving real problems and transfer their knowledge to other students. They learn autonomously by taking the responsibility for their learning and following their individual cognitive styles, interests and preferences. Students learn how to learn. The theories of Bruner and Piaget are the theoretical basis for constructivist learning.
- Teachers are mostly facilitators, co-learners, persons ensuring the right educational resources at the right time, helping students get access to other relevant resources. They also diagnose the students' problems and offer help when needed. The formative evaluation of students' achievements and evaluation based on project outcomes is dominant. The students are also encouraged to self-evaluate their achievements and outcomes, as well as to present them. (ICT offers new opportunities for global student presentations.) The teachers would work both individually and in small groups with the students. They might be assisted by student mentors who would help them and other students in using software tools (Resta, 1995).
- The school is open towards the world. Students solve problems which are formulated either by themselves or by the teacher and come from their everyday lives. The students and the teacher co-operatively solve these problems. This project pedagogy, based on the theories of John Dewey and William Kilpatrick, and empowered by ICT (McClintock, 1992), is considered an alternative to lesson-based pedagogy.
- All space, time, equipment, teaching materials and information resources are used in an extremely flexible way.
- The curriculum, as well as the teaching and learning processes, is highly individualized. Different pathways and support for learning are offered to students who progress at a different speed.
- The system of arbitrarily forming classes by age might be halted and students of different ages encouraged to work and study in small groups.

Most of the above-mentioned principles give rise to new developments both in educational science and in technology, and provide the unique chance to fill in the gap between scientific studies and real school practice. Among the most important recently developed learning paradigms and theories (derived from or related to information technologies) are cognitive flexibility theory (Spiro et al., 1992), anchored instruction (Bransford et al., 1990), minimalism theory (Mejj & Caroll, 1995), Soar (Laird, Newell & Rosenbloom, 1987) and ACT (Anderson, 1990).

Flexible and distance learning, project pedagogy and collaborative learning tend to be widely used in technology-rich university settings. Another tendency is the globaliza-

tion of higher education and international collaboration. One example of such an initiative is the European Association of Distance Teaching Universities (EADTU), which includes the main distance teaching higher education institutions—representing over 325,000 students (Brande, 1993). The Globewide Network Academy (GNA) is one of the most ambitious projects for the virtualization of education—it offers thousands of distance education courses and hundreds of programmes from universities all over the world. The GNA and other virtual education organizations show the tendency of the distance education paradigm being transformed into a distributed learning paradigm (Dede, 1995) which will be based on knowledge webs enabling distributed access to experts, archived resources, shared investigations and learning environments. A mobile learning paradigm might be elaborated in the near future. Partnerships between universities and enterprises in distance learning and training turn universities into a new type of service providers capable of reaching a broader audience.

ICT is already widely used for education and training in organizations. As knowledge and skills are necessary for work, learning is an obligatory element of working. The needs, constraints and technological alternatives of learning support at work differ from those at school (Favorin, 1995). For instance, work is not static and hence workers should be able to adapt themselves to new circumstances and working methods. This means that two separate support systems should be updated continuously—the system for work and the system for learning. The team-learning approach, supported by a collaboration network (hypergroup-ware), is reported to be a successful strategy (Farraro, Rogers & Geisler, 1995). The concepts of 'learning while doing', 'just-in-time' and 'just-in-place' learning applied by using Electronic Performance Support Systems (EPSS) and Computer Supported Collaborative Systems (CSCS) are dominant in learning at the workplace, together with the emerging ICT-based flexible and distance learning strategies for corporate and professional training based on Internet and organization-based intranets.

The direction of the recent changes in ICT-based education and training is from computers as teaching machines towards computer-based collaborative (distance) learning environments.

Multimedia and hypermedia learning environments

One of the main design principles of computer-based learning environments is the principle of interactivity (Sims, 1995). The implementation of interactivity can be perceived as an art because it requires a comprehensive range of skills, including an understanding of the learner, software engineering, contemporary instructional design principles and aesthetically designed multimedia interfaces. Development of effective interactive learning environments will motivate and engage the learner.

Designing a human/computer interface for computer-based learning environments might be based on different concepts and instructional strategies, such as browsing, media integration, metaphors, etc. For instance, browsing (or navigating) allows learners the flexibility to explore a programme or a database, but there is a real danger of being lost in cyberspace. The interface design should incorporate a way to minimize the risk of 'getting lost' while browsing.

The World Wide Web (WWW) is built around three main ideas: physically and geographically distributed documents, unambiguous location of distributed documents and a uniform interface. The Web has no registration mechanism so anyone can create a document and put it on the Web. Especially powerful is the idea of a uniform interface, because the user should not need to switch from one interface to another when using different databases. The idea of a uniform interface is central in the intranet concept—using the Internet concepts and principles in organizations, thereby creating institutional webs of information. The next step is adapting the uniform interface to the personal needs of a learner by using learner's modelling and intelligent Internet agents (Cheong, 1996).

The openness of the WWW and the opportunity of every user to become a multimedia document author give rise to a new generation computer-supported co-operative learning (CSCL) and computer-supported co-operative work (CSCW) systems, such as ComMentor (Roscheisen, Mogensen & Winograd, 1995), CoNote (Davis & Hutchenlocher, 1995), Teacher's Curriculum Assistant and Remote Exploratorium (Stahl, Sumner & Repenning, 1995), SharedARK (Smith, 1995), Collaborative and Multimedia Interactive Learning Environment or CaMILE (Guzdial et al., 1995), etc.

Educational policy issues

Although most educational organizations, businesses, homes, and governmental and non-governmental organizations are still far from being wired to the information superhighway—even in developed countries—the rudiments of the global information society are beginning to appear. How it will be built depends to a great extent on the efforts of UNESCO, whose primary goals are to promote the development of human resources, reduce poverty and unemployment, work for better integration of youth in society, ensure equity in sharing information and knowledge, ensure access to science and technology for all, give everyone the chance to receive education or have a second-chance to be educated, and, finally, to create a commonly accepted policy of co-operation, cultural and educational exchange, peace and global wisdom. How can these goals be realized considering the global tendency of the rich to become richer and the poor to become poorer?

In the global information society, there should be mechanisms that channel information exchange to prevent countries from losing their cultural identities. One of the main tasks of UNESCO now should be to launch an information programme which would aim to preserve cultural diversity in the world, in the same way that environmental protection programmes aim at preserving the biological diversity of the Earth. The issues of technological and (especially) of cultural portability of educational services, products, resources and software are now matters of the utmost importance.

Along with portability issues, we should be aware that a wide educational market has appeared and each institution or organization providing educational products and services should apply a specific advertising and marketing strategy. Advertising developed for traditional media (television, newspaper, posters, etc.) cannot be directly 'transplanted' to the Internet. Internet users do not like aggressive advertising. The best advertisement is making a web page a place worth visiting again. Techniques to encourage repeat visits include making it highly interactive, providing regularly updated information, offering

unique events, etc. (Elsworth & Elsworth, 1995). Of course, a number of on-line security issues have not been completely resolved: site security, privacy, encryption, identity verification, and authentication of data, people, products and transactions.

Another concern is to prevent the Internet from becoming a weapon of crime and information invasion, a new vehicle for 'bad news'. We have seen that television and radio keep trying to prove that 'good news is no news'. I could hardly believe in the successful implementation of an Internet service providing 'bad news on demand'.

Distance education and telecommunication offer plenty of educational and training opportunities for people and organizations. However, fears exist that schools and universities could lose their specific traditions, flavour and autonomy. There is a tendency to impose common standards for all educational institutions. As distance education allows one professor or tutor to teach thousands of students, would it lead to unemployment in universities and schools? Distance education and ICT make it possible for students in geographically separate places to communicate. However, there is a real danger for people who normally communicate face-to-face to 'switch' to the electronic communication mode and lose human contact.

Before a substantial amount of money and effort is invested in ICT-based education, a number of open questions should be answered:

- What are the educational objectives and the expected outcomes?
- How can we bridge the gaps between current educational and training practice and the advances of educational information technology?
- How can we prepare university and school teachers as a human infrastructure ensuring effective application of ICT in education and training?
- How can we organize (locally and internationally) a system to produce educational courseware and educational multimedia resource materials?
- How can we assess the impact of ICT and new educational technology methods on education and training?
- How can we promote the 'best practice' cases?
- How can we ensure equity in access to ICT for all students and teachers?
- How can we preserve cultural diversity?

Most of these questions could be answered by the Global UNESCO Project for the Introduction of the New Information Technologies in Education: *UNESCO Network of Technology Enriched Schools*.

Conclusions

Educational reform needs the synergetic efforts of UNESCO, the EU, national and local governments, policy makers, educators, business communities, public interest groups, parents, citizens, and non-governmental organizations, such as IFIP and the International Association for the Evaluation of Educational Achievements (IEA). It is a matter of crucial importance that countries in transition participate in the EU's educational and training initiatives and programmes, such as PHARE (including TEMPUS), COPERNICUS, SOCRATES and LEONARDO, as well as in all UNESCO initiatives and projects.

Note

1. This is a slightly edited version of a paper presented at UNESCO's second International Congress on Education and Informatics: Educational Policies and New Technologies, Moscow, 1–5 July 1996.

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NEW APPROACHES FOR TEACHING, LEARNING AND USING INFORMATION AND COMMUNICATION TECHNOLOGIES IN EDUCATION[1]

Tjeerd Plomp, Alfons ten Brummelhuis and Willem J. Pelgrum

What is the direction for the future of learning?

Computers, especially when they are linked in networks, have the potential to dramatically change everyday classroom practice. The impact of the use of information and communication technology (ICT) in education will not be limited to the actors involved in the learning process (teachers and students), but will also change the institutional infrastructure, relations and patterns of behaviour within the education system, and even the content of education. For a good understanding of these educational changes it is necessary to look at the transformation industrialized societies are undergoing.

Education is reacting to the emergence of the information society. Traditionally, schools provided the settings where individuals were prepared for the industrial society. In this society the focus was on 'making things', on industrial production. Today's edu-

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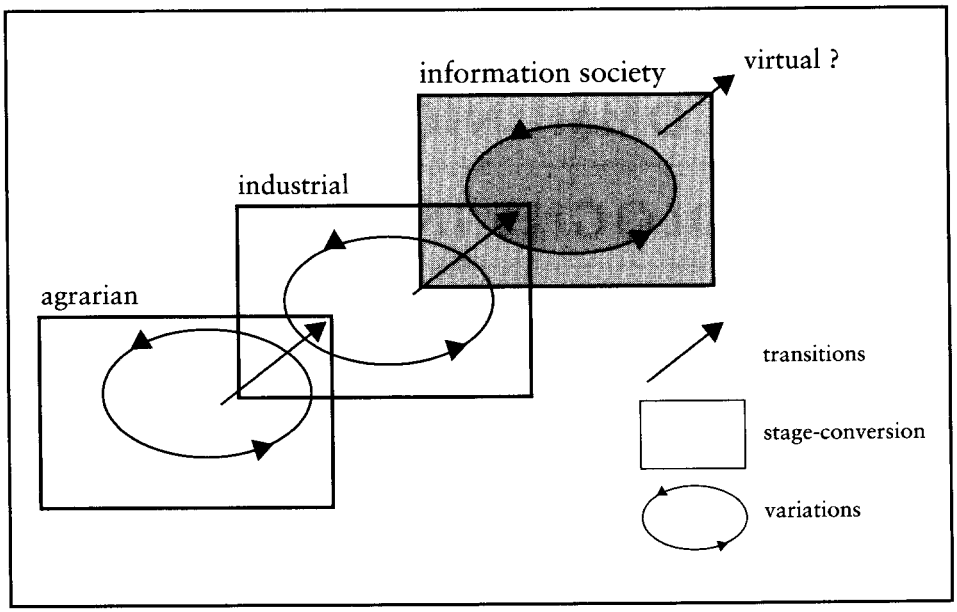
cation system faces the challenge to prepare individuals for the information society in which one of the most important aims is to handle information. Such a shift in focus can be seen as a new stage of our society, characterized by a new predominant paradigm. A simple overview of the successive stages of development of our society is depicted in Figure 1.

FIGURE 1. Successive stages in the development of society



Source: COMMITT, 1996.

The stages in themselves are not stable: in each stage, changes and developments are taking place continuously, but these changes tend to stay within the boundaries of the dominant paradigm and the reigning technology. The problems faced are basically variations of common practice, while the order of things is kept in place. After a period of time, successive variations get less effect and tension grows until the next stage is apparent and a transition takes place. The conversion to a next stage is influenced by the availability of a catalyst of some kind (money, new energy sources or technological developments such as computers, networks, etc.).

In general terms, the mission of the education system is: to provide balanced, personal, social and vocational education; to facilitate personal growth, development and citizenship; and to prepare students for a profession. Quality of education can be defined as the degree to which education is capable of realizing these goals. In addition to the challenge of preparing individuals for the information era, the education system is facing other challenges:

- Education is expected to contribute towards the solution of social, cultural and economic problems of society. Education can no longer remain uninvolved in all of the problems of society: isolation, ethnic integration, juvenile delinquency, unemploy-

ment, etc. There is massive evidence that one's level of education correlates directly to the opportunities one has in society (see various OECD reports published between 1988 and 1994).

- People want education to be individualized and flexible, suited to their specific needs. Growing individualization in and diversification of society calls for specific approaches in education. Standardized methods and classroom approaches will no longer be sufficient for individual needs.
- Life-long learning and new demands for learning are rising. The 1994 report of the SCP (the Dutch national office of social and cultural studies) states that the main issue to be addressed by the educational community is the growing number of people participating in education. Under the current circumstances, the guarantee for open and equal access to education for everybody is becoming almost unaffordable.

It can be concluded that the near future provides all kinds of challenges and opportunities for the education system in our society. Managing large amounts of information, developing learning strategies to facilitate effective learning, and assuring that all citizens are skilful in assessing, selecting and dealing with information are of critical importance. It is assumed that a new balance is needed between teacher-oriented arrangements of the learning process and student-oriented arrangements, with much more emphasis given to the latter. ICT provides a means to bring about the revolutionary changes called for by the evolutionary transitions in society. As a tool to support the learning process, ICT holds a promise of new solutions for the challenges facing education.

DIFFERENT SCOPES FOR THE USE OF ICT IN EDUCATION

The use of ICT as part of the learning process can be subdivided in three different forms: as an *object*, *aspect* or *medium* (Netherlands, 1992). In addition, ICT is often used as a tool for organization and management in schools. In the latter case ICT is not integrated in the actual learning process but provides support to it at the classroom or school level (an example of an ICT application for organization and management purposes is a student-monitoring system).

The use of ICT in education as an *object* refers to learning about information technology and is mostly organized in a specific course such as 'computer education' or 'informatics'. As an object, ICT has been broadly implemented in the curricula of schools, especially in secondary education. Following the 'ICT-as-object-courses', students familiarize themselves with the most important 'ins and outs' of information technology as a dominant phenomenon in society. Its educational aim is the prevention of computer illiteracy. At present, education is quite good at this. But we have to take Walker's (1986) warning seriously, namely that the easiest way to meet the challenge of technological revolution is to create and implement a new subject so that the existing subjects do not have to change.

ICT as an *aspect* refers to specific applications of ICT in education as used in industry and professional practice. For the most part, such use in education is found in vocational education, for example in the training for computer-aided design (CAD), computer-

aided manufacturing (CAM) and computer-mediated accounting. Vocational training in these areas is unthinkable without ICT integrated into it. ICT as an aspect also appears outside the vocational territory in subjects that are no longer teachable without the technology—for example, in general education experiments in science education, or accounting as a part of economics. For that reason ICT has become an obligatory part of the general exams in science and economics in general secondary education in the Netherlands. The educational aim of ICT as an aspect in education is job preparation.

Today, ICT as an object and as an aspect are firmly embedded in our educational practice.

A third form of use is ICT as a *medium* for teaching and learning. This refers to ICT as a tool for teaching and learning itself, the medium through which teachers can teach and learners can learn. ICT as a medium appears in many different forms, such as drill-and-practice exercises, simulations, tutorials, individual learning systems (ILS), educational networks, hypermedia programmes, test-generating systems, etc. We speak of ICT as a medium whenever ICT is used to support the teaching and learning process and not specifically its content (which is the case when ICT is used as an object of learning). Current actual use of ICT as a medium is rare, though there is a growing interest in this application.

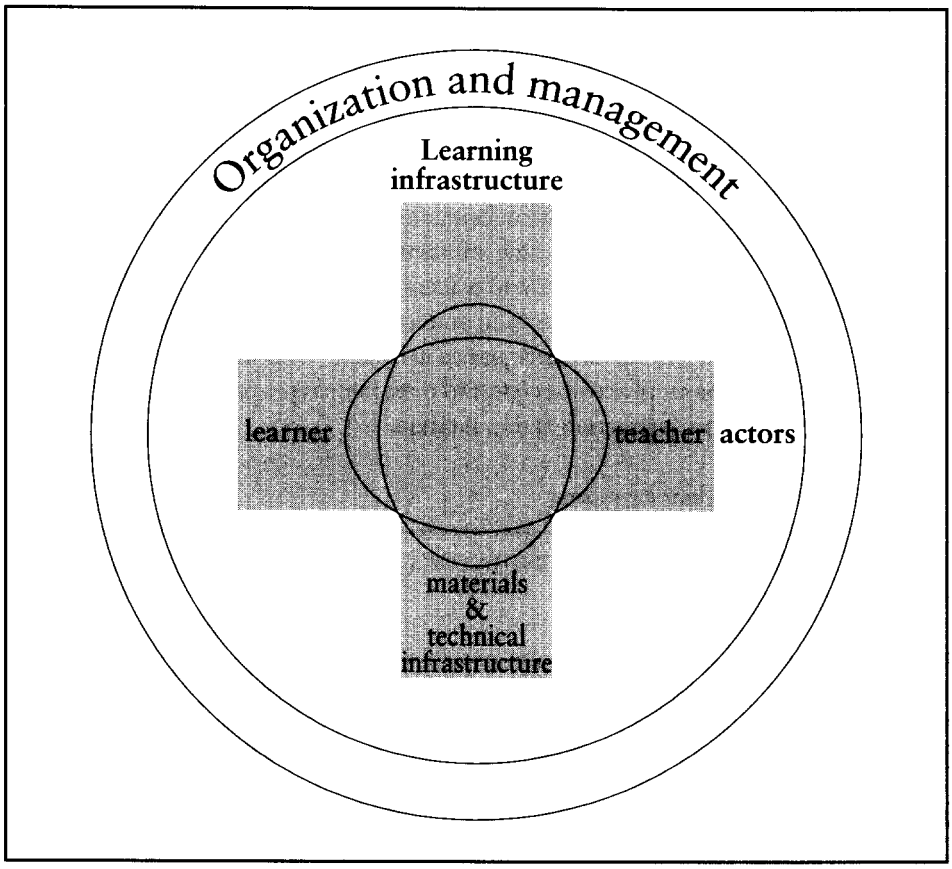
In this paper we will focus on the use of ICT as a medium in learning and teaching.

ICT AS A MEDIUM TO ENHANCE THE LEARNING PROCESS

For a good understanding of the potential of ICT for teaching and learning, it is important to have a closer look at the learning process. Figure 2 provides a general overview of aspects influencing the learning process. The learning process is represented as a field in which four forces operate. The horizontal dimension represents the relation between the *actors* in the learning process: the teacher and the learner. The vertical dimension represents the *learning infrastructure,* consisting of content, and teaching and learning materials. The learning process takes place at the cross-section of these four forces. The contribution at the level of school organization and management to the arrangement of the learning process (e.g. by provision of a student-monitoring system) is represented by the outer circle.

The figure illustrates the view that a learning process is the result of both structural conditions derived from the learning infrastructure and personal characteristics of the actors involved, and their interaction. Changing just one of the driving forces may lead to tensions, but not necessarily to substantial changes and improvement of the learning process. The introduction of ICT in the learning process, as a medium for learning, obviously changes the learning infrastructure in terms of materials and technical infrastructure. But only in conjunction with changes in the roles of the teacher and the student, and with changes in the organization of the content, is it possible to make use of the potential that ICT holds for enhancing the learning process.

FIGURE 2. The infrastructure and actors of the learning process



In addition to the above-mentioned dimensions of the learning process at the school level, changes in the learning process have to be supported by the public administration as well. It is hard to imagine how ICT as a medium can be implemented in a way that it has an impact on the role of the teacher without proper policy measures at the level of the national government. For instance, installing computers and software for an integrated learning system is one step and a relatively simple one compared to what has to be done for a structural change in the role of the teacher (needs consent by teachers, teachers unions, management, government), a commitment to more student-oriented learning (needs organizational measurements to regulate the use of school resources), and a focus on learning which is often labelled as 'constructive learning'. Learning is, in this view, perceived as an active, constructive, goal-oriented and situated process.

THE LEARNING PROCESS IN MORE DETAIL

Adjusting education to the societal needs of the future (the information society) means that schools have to enable learners to be continuously active in the sense of lifelong learn-

ing. Stimulating and supporting this process of continuous learning implies the elaboration of suitable learning processes in which the learner learns how to become more or less an architect of his/her own learning processes. This means that learners have to be more involved in the arrangement of their own learning process. However, learning always refers to a process in which the learner needs support in terms of well-adapted subject matter content, organization of learning activities by a teacher, adequate materials and technical infrastructure. It is assumed that ICT has the potential to enhance such a learning approach that prepares students for the information society.

The use of ICT as part of the learning infrastructure and its relation to the role of the actors in the learning process (learner and teacher) can be clarified by looking in more detail at the characteristics of the teaching and learning process. Table 1 provides an overview of the activities that can be distinguished in relation to the learning process (Simons and Zuylen, 1995). The set of activities refers to three main types of activities in the learning process: preparation, instruction and evaluation.

TABLE 1. Activities in the learning process

PREPARATORY ACTIVITIES	INSTRUCTION	EVALUATION ACTIVITIES
Cognitive		*Cognitive*
Orientation towards learning goals and strategies	Absorbing knowledge	Testing progress and learning process
Clarifying learning goals	Practising skills	Controlling progress and learning process
Choosing and defining subgoals	Reflecting	Taking recovery actions
Choosing and defining learning strategies	Formulating conclusions	Reflecting learning process and progress
Mobilizing prerequisite knowledge	Relating to what's learned/getting an overview	Evaluating
	Conditions and possibilities for application	
Affective		*Affective*
Making students curious		Controlling and regulating concentration
Challenging oneself		Keeping motivation
Generating interest		Generating feedback
Focusing attention		Relating results to strategies used
Clarifying relevance		Self-assessment
Getting underway		

Source: Simons & Zuylen, 1995.

In a traditional arrangement of the learning process, most of the activities listed in Table 1 are under the teacher's control. If a learning process is more student-oriented, it

means in operational terms of the activities listed in Table 1 that the student becomes more responsible for some of the activities which are completely under control of the teacher in the teacher-oriented learning process. It is assumed that a shift from teacher-oriented arrangements of the learning process towards more student-oriented arrangements can be facilitated by ICT. However, until now this potential of ICT has hardly been implemented. Student-oriented learning processes are still rare, and most of the current ICT applications are used as far as they facilitate the teacher-oriented arrangements of the learning process. Applications of ICT are adapted to the existing teaching routines: the beliefs and attitudes of teachers towards their teaching practices do not change, and basically the teaching and learning process itself does not change.

For the development of effective strategies to use ICT to enhance learning and teaching it is important that we realize that the present use of ICT is just a *substitution* of the current teaching and learning activities. This substitution use can be seen as the first out of three phases through which the implementation of new technologies diffuses in general and therefore also in education (Itzkan, 1994).

PHASES OF TECHNOLOGICAL DIFFUSION

The three phases of technological diffusion are shown in Figure 3. In the *substitution* phase, the technology replicates or automates the existing instructional practices. The technology is used for activities which people already do in education, e.g. drill-and-practice exercises on the computer refer to the use of computers as 'electronic paper'. This kind of use is not bringing about real change in education, and therefore by its character will not meet the real needs of education in an information society as discussed above.

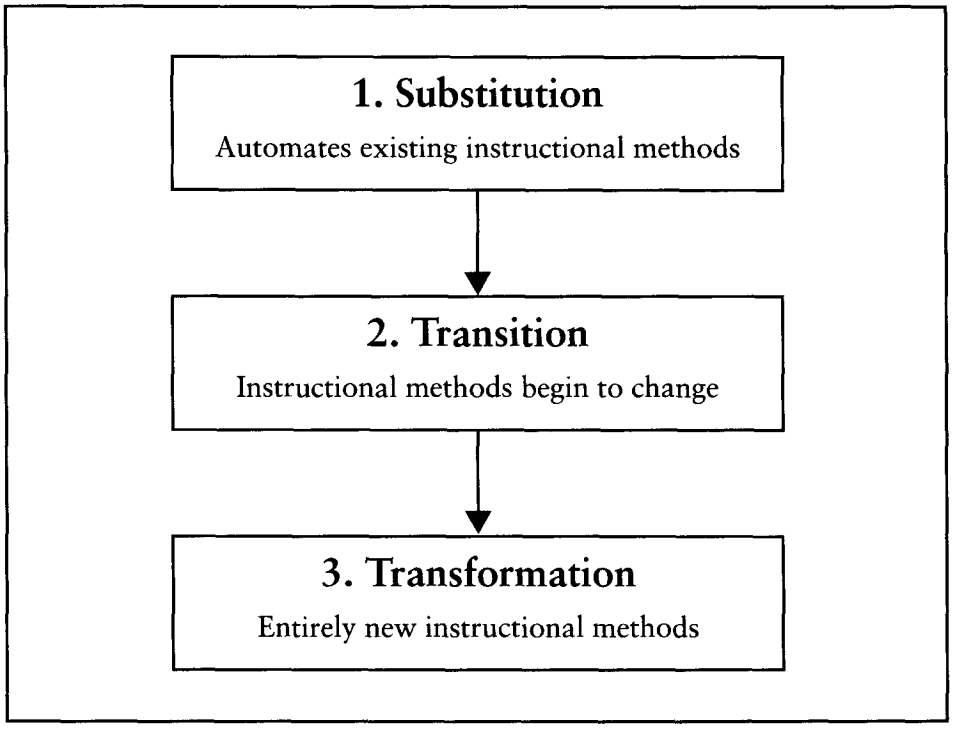
New instructional methods begin to evolve in the *transition* phase, for example the use of e-mail in foreign language classes to communicate with peers who are native speakers. In this phase the technology is used for activities for which it was not necessarily brought in, and it challenges old instructional practices.

In the *transformation* phase, the final phase of technology diffusion, the technology provides completely new instructional situations and the old customs may become obsolete. The instructional tasks for which the technology was originally acquired may no longer be desired.

The underlying rationale of the phases of technological diffusion is that it is a mistake to suppose that new technologies will continue to fit existing or old practices. If we continue to use ICT only as a substitution for existing practices, ICT will not contribute to solutions for today's problems in education. We might be left with only artificial interventions that by their nature provide no way out for the problems of continuous harsh budget cuts (solution: more money), multi-cultural students (solution: more teachers), a constantly changing economy (solution: more specialized subjects) and high unemployment (solution: more study).

It is important to note that in a traditional, mostly teacher-oriented educational setting the teacher is completely responsible for the arrangement of most of the learning activities. It is inevitable that the role of the teacher will increasingly change if the student is more actively involved in his or her own learning process and ICT is adopted to support an increasing number of learning activities.

FIGURE 3. Phases of technological diffusion



Source: Itzkan, 1994.

Although it is uncertain to what amount this shift will take place and how much time this will require, the direction of future change is clear: the learner will become more responsible for the arrangement of his/her own learning process. Or in other words, a new balance between student-oriented and teacher-oriented arrangements is needed to have education meet the challenges of the information society.

An important question in this context is to what extent our present education systems are already changing in this direction and whether the use of ICT is reflecting the transition phase.

Where are we in the early 1990s?

Where the first section of this paper addressed the question of the future direction of education and the potential of ICT to help reach this future, this part discusses where we are in the early 1990s. Knowing where we are is important baseline information for policy makers and those in charge of shaping the future of our education, as it provides the starting point for determining the route to the future.

THE IEA COMPUTERS IN EDUCATION STUDY

The Computers in Education Study of IEA (International Association for the Evaluation of Educational Achievement) provides information about the status of information technology in education in a number of countries in 1989 and 1992. The major aim of the

study was to build a knowledge base from which answers about the *what* and the *how* of the use of computers in education could be obtained.

It is important to realize that the Computers in Education (CompEd) study took place in a period during which personal computers were the dominant form of information and communication technology used in schools. When the preparation for the CompEd study started in 1986, personal computers could almost not be handled without a basic knowledge of programming, while by the early 1990s computer users had access to many easy-to-use tools. During the 1980s, due to many initiatives of schools and teachers and stimulation policies of governments, computers also became available to schools. They were mainly used for computer literacy type of courses (in secondary education) and electronic drill-and-practice exercises (in primary education).

The CompEd study focused on primary and secondary education. Data were collected in 1989 and 1992. In 1989 twenty countries participated in the study with national samples of both computer using and non-using schools, and using as well as non-using teachers of computer education, mathematics, mother tongue and science. In 1992 data were collected at the school, teacher and student levels in twelve countries.

The general broad indicators for which quantitative data were collected in each stage are listed in Table 2. The rationale for selecting these indicators has been extensively described in CompEd publications, for example Pelgrum and Plomp (1993).

TABLE 2. Overview of main indicators collected in 1989 and 1992 in the CompEd study

Educational level	Indicators
Country	National policies School system characteristics
School	School policies Experience with computers Hardware availability Software availability Attitudes of the school principal Organization of computer use Type of use Staff development Number of using teachers
Class/teacher	Teacher use Teacher knowledge Teacher training
Class/student	Student knowledge Student attitudes Student school use Student home use

Source: CompEd study.

Data about the use of computers in education have been collected from over 20,000 teachers, 10,000 schools and 150,000 students.

SOME EXEMPLARY RESULTS

The results of the CompEd study have been described in numerous publications (for example, Pelgrum and Plomp, 1991, 1993; Pelgrum, Janssen Reinen and Plomp, 1993). Here we present only a few results based on the data of four industrial countries (Austria, Japan, the Netherlands and the United States) to illustrate that the use of ICT in education was still in its infancy in the early 1990s, even in industrial countries.

From the results the picture emerges that during the 1980s and the beginning of the 1990s the number of computers available in schools had rapidly increased (see Figure 4). A further growth can be expected. Noteworthy is the 'late start' of Japan.

FIGURE 4. Percentage of lower secondary schools with computers

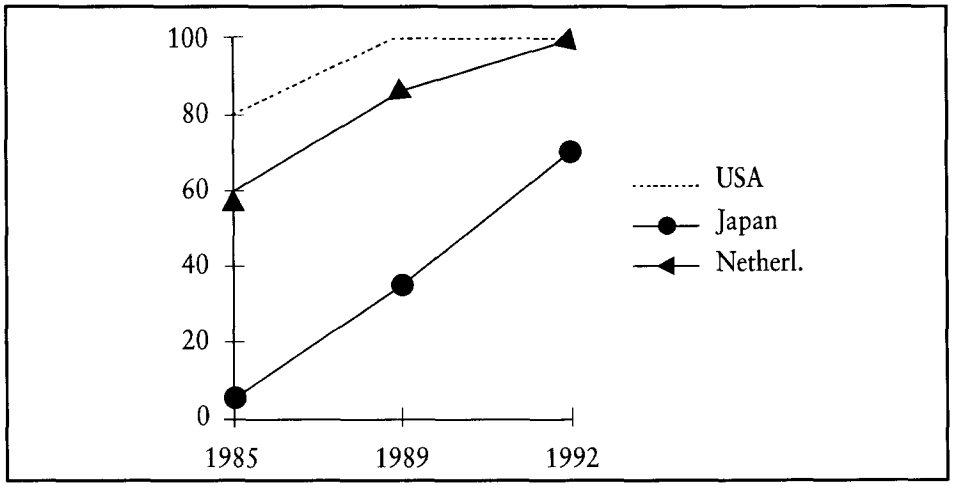
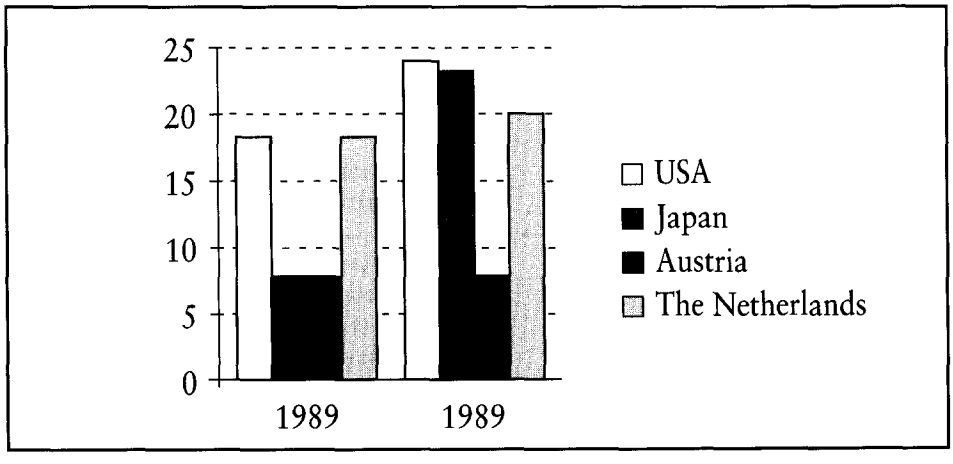


FIGURE 5. Average number of computers in lower secondary schools

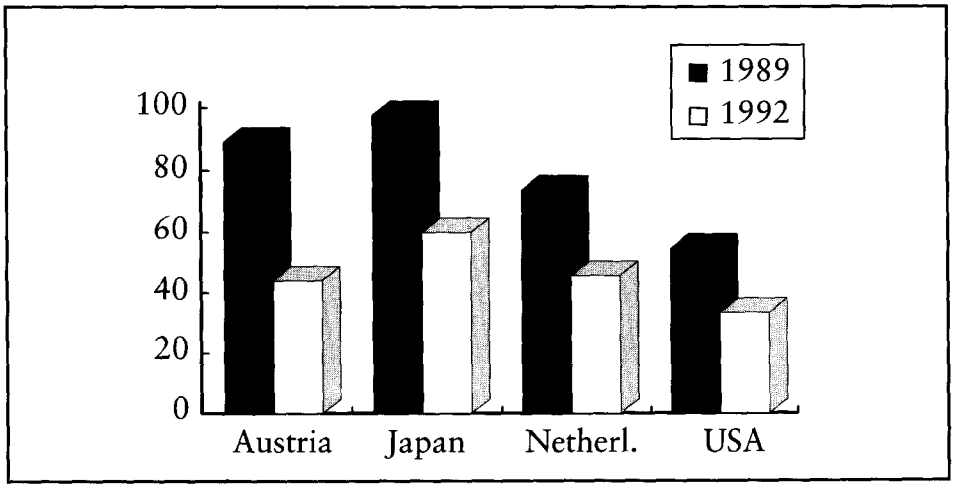


In 1992, however, the number of computers in typical schools was just enough to allow one class at a time to use them (Figure 5). Thus, in 1992 the hardware infrastructure in general (even in industrialized countries) was not sufficient to allow a broad and intensive use of information technology within the schools.

Particularly important in the recent past has been the development of electronic networks. The CompEd data show that in 1992 there were hardly any schools which had regular access to external networks, except for in the United States where 17% of lower secondary schools and 12% of elementary schools were using computers almost weekly for access to external networks (Pelgrum, Janssen Reinen & Plomp, 1993, p. 17).

The lack of sufficient software was a major problem in 1989 (Figure 6). This substantially decreased between 1989 and 1992. The most common didactical approach was drill-and-practice and tutorial programmes, which means automating already existing methods (i.e. substitution use of technology).

FIGURE 6. Percentage of lower secondary schools lacking software



The most popular use of computers at schools in 1992 was to teach students how to use this new technology. Many students were attending computer education classes. The use of computers as tools in existing subjects was still marginal, as shown in Figure 7. The percentage of students using computers in other subjects was even less than the percentages in mathematics.

The integration of computers in lessons was still seen as requiring considerable additional time investments (Figure 8). This is a major concern. Future use of ICT in education means integration into the daily practice of learning and teaching. Time needs to be made available for teachers for such a change in education practice.

The expectations regarding the added value of computers were quite high, as shown by the opinions of school principals (Figure 9).

FIGURE 7. Percentage of students in lower secondary schools working with computers in informatics and mathematics classes

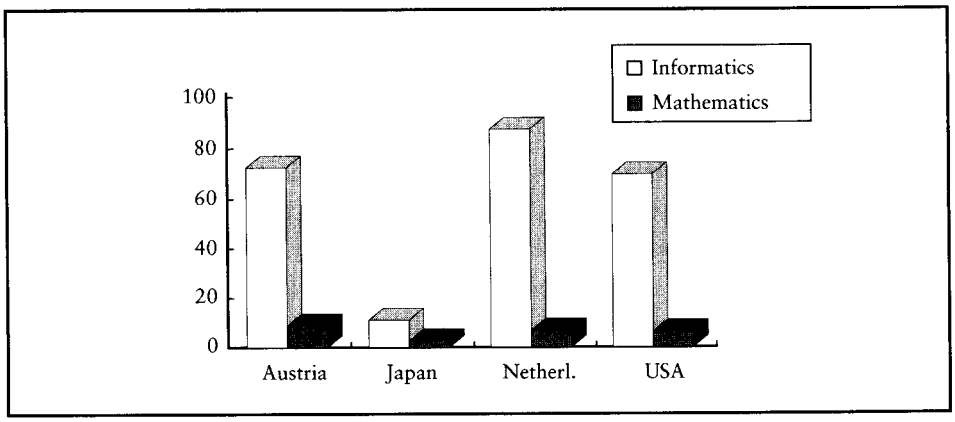


FIGURE 8. Percentage of lower secondary schools reporting insufficient time to integrate computers in lessons

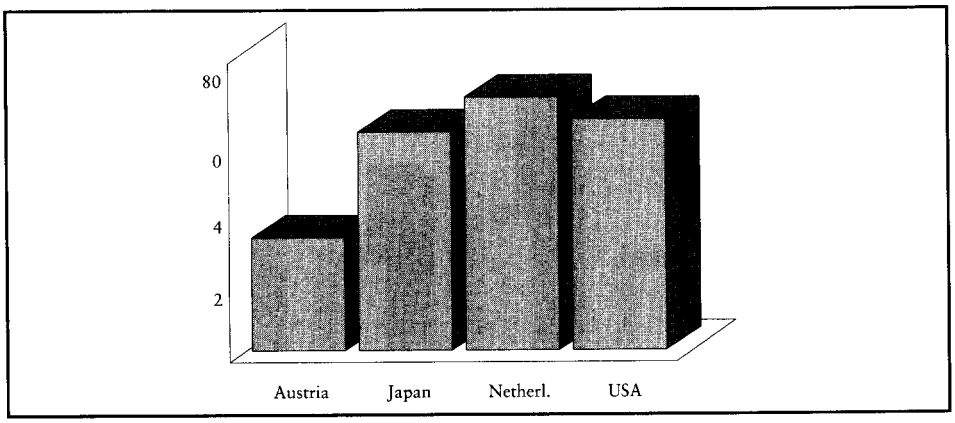
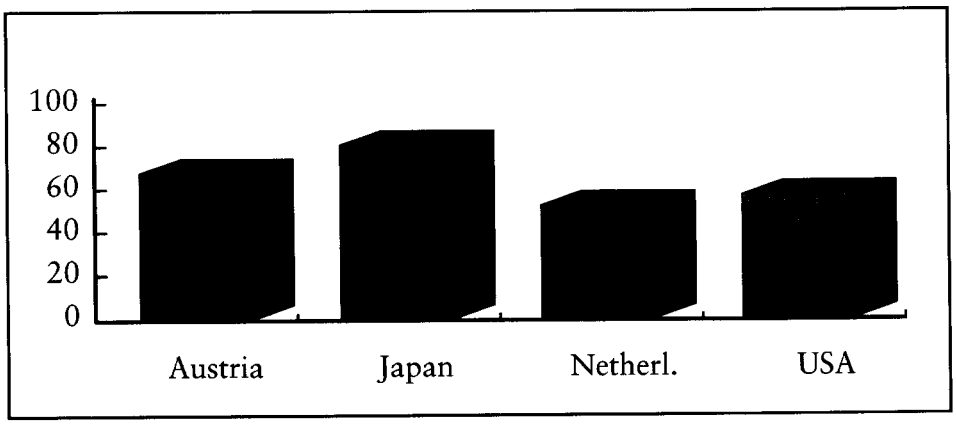


FIGURE 9. Percentage of lower secondary school principals who say that students are more attentive when computers are used



Many analyses were conducted on the CompEd data. For instance, Tuijnman and Brummelhuis (1993), Brummelhuis (1995), and Janssen Reinen (1996) showed the complex interactions of a number of factors influencing the degree of infusion of computers in the school curriculum (see Figure 10). It is important that policy makers understand that there is not a single factor that determines the integration of technology in education, but a group of interrelated factors which may differ in different stages of introducing information technology in education. Besides, certain necessary conditions have to be fulfilled, such as having a computer co-ordinator in each school.

En route to the future

Our analysis so far leads to two conclusions. First, our society increasingly requires learning situations responding to the need for *flexibility* (adapting to different needs), *accessibility* (learning when and whenever suits best) and *support* (an adequate learning infrastructure to assist learners). To make this happen, more emphasis should be given to student-oriented arrangements, and ICT provides powerful possibilities to realize this. Teachers, being key actors in learning and teaching processes, need to be trained in designing and organizing such innovative teaching and learning environments. The learning infrastructure of the schools needs to change accordingly, both the content of what is being taught, as well as the materials and technical infrastructure (see Figure 2).

A second conclusion drawn from the CompEd study is that in the early 1990s ICT use in education was predominantly the use of computers, reflecting usage characterized as substituting for already existing didactical functions. The integration of technology in the daily practice of school is a process influenced by many different factors.

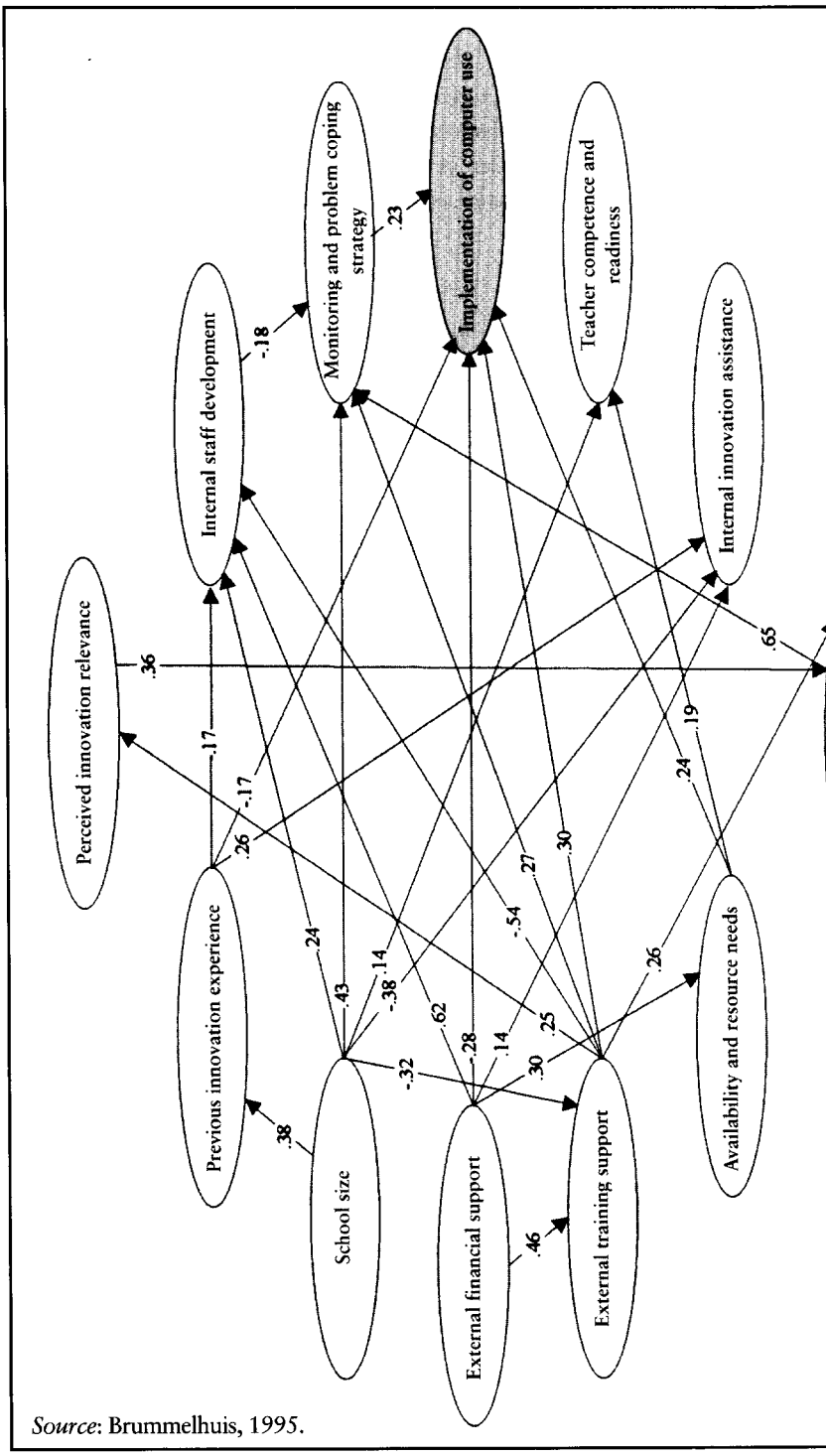
So the question is how to get *en route*! This question will be discussed by applying a system analysis point of view.

A SYSTEMS APPROACH

From the perspective of a systems analysis approach, we could regard society as the relevant environment of education. Education is defined here as the set of all educational practices; society as the place where education finds its people and resources, and to which it delivers its results. Schools and teacher-training institutes are, among other institutions, subsystems of the education system.

A system tends to pursue an equilibrium with its environment. It tends to organize its internal processes and exchange with the environment in such a way that it stays stable and viable. To do so, systems have to cope with the complexity of their surroundings by controlling variety. The variety of educational needs in society, for example, is balanced with the variety the schools can accommodate. No school can meet all of the individual learning characteristics of its students. In most cases, this is not much of a problem and most people accept the fact that a school can offer a limited variety of learning possibilities. However, in order to stay in balance with the (learning) needs of society, schools have to maintain their level of variety above a certain threshold. When the learning offerings of a school drop below that level, too many student-learning needs cease to be met and the

FIGURE 10. Factors influencing the implementation of computer use in education



Source: Brummelhuis, 1995.

system gets out of balance. This imbalance could subsequently result in a decreasing number of registrants, a rise in dropouts, less public and/or political support, increase of classroom troubles, etc.

Numerous subsystems surround schools, such as teacher-training institutes, institutions for curriculum development, test development, school support institutes, educational publishers, furniture providers, educational software developers and others. Each of them has a specific function for education. Together they act as the safe-keepers of education. Whenever education has a need, expressed by the educators themselves, by the management or government administration, one of the safe-keepers will react with some sort of service by implementing small but important changes. In doing so, their support activities are not only defined by the existing education system but, in turn, keep the education system within the margins of *controllable variability*. They are designed to act in this way. But this makes them more the custodians of the present situation than the change-agents of education. This is a fundamental problem if one wants to bring about real change in education.

Besides these continuous adaptations, there is another kind of change emerging in education, namely change that goes beyond the boundaries of controlled variety. As long as education succeeds in answering the needs of society, it fulfils its function towards society and it stays stable and viable. But when the demands that society puts on education can no longer be met by more variety, the system itself (i.e. education) needs to change.

It is our belief that this is the case nowadays—that our society has moved towards a new paradigm, characterized by the 'information society'. This demands a new relationship between education and society or, in other words, implies a need for the transformation of education as well as new definitions of education. These new definitions of education will come from the learning needs and possibilities in the information society. They should not be regarded as developing linearly out of today's education. The consequences for education of the transformation from the industrial society into the information society are depicted in Figure 11.

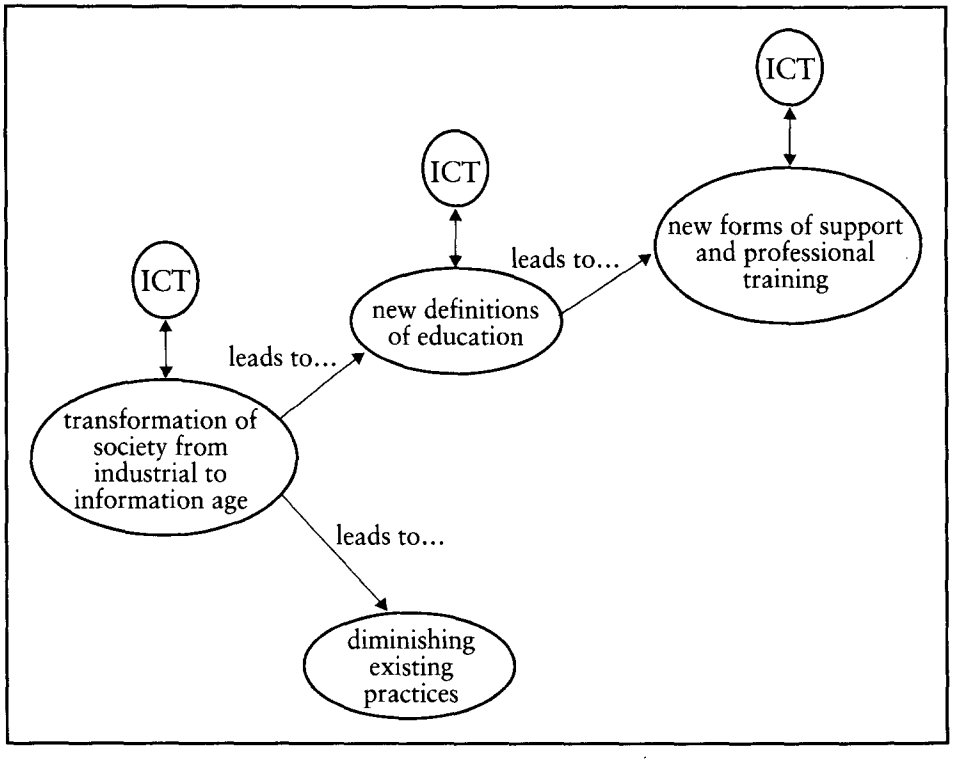
In order to facilitate this transformation, it is required that the education system revises its relations with society, takes its needs seriously and gives its demands the highest priority. These demands were already mentioned in the first section as the challenges facing the education system.

Developing a future for learning

In order to prepare schools and teachers for education of the future, schools and teacher-training institutes should shift their focus from serving the current style of education to serving what emerges as the education of the future. They have to create both room and opportunities in their programmes for such a transformation. This causes a dilemma, as schools and teacher-training institutes cannot refrain completely from providing current education with teachers that can function in the existing situation.

A solution to this dilemma is to create a transition period from the present situation towards a future situation in which education will get its new shape. This implies stimulating and strengthening the development of something 'new' while the 'old' still exists.

FIGURE 11. Consequences of ICT on education



During such a transition process the 'old' needs care and attention, but should not prevent the 'new' from growing. 'Old', that is our present schools and teacher-training institutes, should be challenged to transform into 'new'. But at the same time, the 'new' needs stimulation and incentives, and should not be hampered by the 'old' trying to continue its previous equilibrium with its environment.

This demands a programme of action that has to provide bridges from 'old' to 'new'. The programme has to be designed in such a way that it creates opportunities for new definitions of education and at the same time challenges educators from existing practices to participate. However, the main focus of the programme should be on generating and supporting 'emergent practices' of learner-oriented arrangements with ICT as a medium, as well as preparing both teachers and student-teachers for the 'emergent practices' in primary and secondary education. This refers to the use of ICT as a medium in the schools, but at the same time an aspect of the teaching profession and therefore of teacher (in-service) training. A coherent research and development programme, in combination with an adequate monitoring process of firsthand experiences, is expected to create a clear picture of both tomorrow's teacher training and the educational practices in the field for which teachers are being prepared. In 1996, the Committee on Multimedia in Teacher Training (COMMITT) proposed such a programme in its final report (COMMITT, 1996).

Note

1. The first and third sections of this paper are based on a report of the Committee on Multimedia in Teacher Training (COMMITT); parts of the report have been used with permission. The second part is based on Pelgrum, 1996.

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TRENDS/CASES

ARE THE SEEDS OF VIOLENCE SOWN IN SCHOOLS?

Marina Camargo Abello

Introduction

Any mention of school violence produces ambivalent feelings in me. This is, firstly, because I consider that the indiscriminate use of this term, without particular specification, has neutralized any meaning it had, and this in two ways: to some extent through the belief that many social and personal phenomena constitute violence[1] and partly through lack of reflection. The second reason is that violence in the education system is a problem that has been little studied—its very existence is sometimes denied, no thought is given to it, and school processes, activities and interactions never explicitly and purposefully pay any heed to it.

In an effort not to fall into either extreme—i.e. the view that everything is violence or that nothing is happening at all—I shall try in this article to put forward a conceptual proposal with regard to school violence in Colombia; to draw attention to the gaps in scientific research on the subject; to describe the ways in which violence takes place in terms of its different origins and the environments where they occur; and, lastly, to present some general conclusions as a form of working horizon.

What is understood by violence?

Generally, violence is understood to designate two types of phenomena. The first of these is political violence, which is woven into the history of our country. The second refers to

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the increasing violence which Colombia has been experiencing in recent years. This second type is associated with the appearance of drug trafficking and paramilitary groups, changes in the organization, forms of subsistence and forms of combat used in guerrilla warfare, manifold forms of corruption, generalized warfare, the aggravation of kidnapping and an increase in delinquency.

What both of these types of phenomena have in common appears to be an explicit or implicit state of confrontation, in the course of which some individuals terminate the lives of others, thus opening up a huge breach concerning the respect of human rights. In this sense, violence appears exclusively as an act of physical aggression against a person, using some kind of weapon, ignoring the system of justice prevailing in society, associated with apparent or real physical superiority, based on different motivations (economic, political, social, ideological or cultural) and leading to the extreme consequence of death.

Many analysts of violence have been trying to put forward indicators on the basis of this definition in order to determine the presence and expressions of violence, as well as the factors or variables with which it appears to be associated. Thus, crimes, murders and deaths are the data which have to be taken into account with respect to violence in the country. This strict limitation is based on the distinction between violence and human suffering, whereby the former, as we explained above, implies an action with physical consequences, while the second is characterized by:

> disaffection, indifference, blackmail, anger, rejection, low wages, pollution, abandonment of the home, drug addiction, the denial of the legal rights of trade unions, restrictions on free circulation, racial segregation, plus an endless list of social and personal phenomena (Gaitán Daza, 1995, p. 184–85).

Nevertheless, it is hard to accept that the only type of violent act is one which culminates in either physical injury or death, to the exclusion of other types of aggression of a more psychological and symbolic nature, which will nevertheless undermine a given social order, the social relationships established within it, and the personal and social development of its members.

The school system and violence

People seem to behave as if violence does not exist in the institutions and areas where daily life goes on, such as the family, school, work and the street.

In the education system, in particular, the existence of violence is repudiated, so that it does not constitute a significant issue for discussion. Faced with the daily horror of crimes, murders and massacres, one tends to lose sight of problems which may be just as serious, though less dramatic and less spectacular. Other forms of violence have impregnated social institutions under the pretext that they represent 'nothing serious', compared with the gravity of what is happening elsewhere.

Nevertheless, different kinds of violence do occur in the education system, such as: (a) that which occurs in society as a whole, i.e. deaths, threats or intimidating letters (known as *boleteos*); (b) aggressive behaviour aimed at intimidating another person, either phys-

ically, psychologically or morally; (c) situations of intolerance, discrimination or disregard for others; and (d) a lack of systems and mechanisms for channelling anger, despair, non-conformity, frustration and conflict.

The contribution of research

The analysts of violence at a macro level—sociologists, anthropologists, historians and economists—all confirm how little is known about the subject, while drawing attention to gaps in the research and in our understanding of the socio-cultural impact of violence. Little is known, for instance, of the way it penetrates social and cultural institutions from the point of view of representations, attitudes, values, relations and forms of personal development.

To this is added the low level of interest the issue attracts—judging from the scant documentation and discussion about it among educational researchers,[2] including sociologists, anthropologists, educators and teachers. Despite the fact that the topic runs right through education, where many people are deeply involved, its study must still be considered as a marginal pursuit.

Why this lack of interest and research? Firstly, there is a blind spot which is not always intentional, namely a refusal to see the violence which we may be reproducing from society or the violence we may help to generate within the education system. We are only prepared to recognize violence in its frightening, extreme forms—deaths, murders and massacres—or in the form of kidnappings and detentions, or street violence in the form of robberies, assaults and looting. We may observe social violence, but we do not question it—neither in our institutions nor in our relationships within them. Secondly, the actual conceptual limitation of school violence makes it difficult to address the issue in any serious or systematic way. Thirdly, feelings of fear, escapism, survival or indifference also make people reluctant to face the problem of violence. And, lastly, the prescriptive approach of the school system, whereby 'ought to' comes before 'is', hampers the analysis of a difficult, complex phenomenon, which may detract from the system's idealized image.

The seeds of violence

In order to study violence in school, one first needs to define the concept of its origins:

- In school, attitudes, practices and relations generate areas of misunderstanding, discrimination, exclusion and marginality, which can lead to a disregard for and rejection of other people and eventually either to outbreaks of violence or to violence-prone situations. This is the phenomenon I like to refer to as 'the seeds of violence'.
- If the seeds of violence are present in the school, then it is possible that the education system actually fosters social violence in some way, i.e. by sowing the seeds of violence.
- The seeds of violence may exacerbate four types of social violence: economic, political, the ethics of co-existence and backwardness.

Events, relationships and situations occur within the education system and may lead to germinating the seeds of violence, partly in the course of interactions—either with other

individuals or concerning the knowledge, rules and components of the school's organization and administration—and partly in the running of the school, through its way of exercising authority and resolving conflicts.

It would be unfair to say that these situations occur throughout the education system, but even if the seeds of violence are sown, germinate and mature in only one educational institution, that would be matter enough for concern.

The seeds of school violence and social violence

The seeds of school violence may develop in four areas of social violence:

1. *Economic violence*: here, the basic cause of social violence is attributed to the situation of poverty, marginality and exclusion which deprives a substantial proportion of the population of society's benefits. In the educational field, it is related to the supply of education in terms of coverage and quality. According to this approach, injustice, low quality and insufficient access to education create problems in society likely to generate violence.
2. *Political violence*: in this case, social violence is placed in the context of the violation of human rights and its causes are ascribed to inadequate mechanisms of justice. As far as the education system is concerned, it is associated with civic values, such as recognition of differences, justice and participation. When these values are denied or distorted, the effects are transmitted through the concepts and practices inculcated in the course of training.
3. *Violence in the area of a co-existence ethic*: this approach looks upon interaction (between individuals and groups and between these and institutions) as a social area where individual and collective lives are played out within a framework of clear rules ensuring the minimum required social order. The arbitrary quality of the standards and regulations applied in schools and the preference for authoritarianism as a way of resolving conflicts and as the dominant form of relationship are the school's contributions to social violence, once again by way of the training process, i.e. through the acquisition of attitudes and practices which shape the symbolic world of individuals and motivate their behaviour.
4. *Violence of backwardness*: development is inhibited insofar as backwardness is seen as a determining historical situation which is difficult to overcome and which restricts any effort to establish relations with other sectors on an equal footing. The school, as the bearer of knowledge, and knowledge, as a resource which is indispensable for a society's development, are linked to this type of violence through the ways in which knowledge is distributed and circulated, and through the conceptions generated by different ways of interacting with knowledge. In particular, dogmatism, rote learning and an authoritarian approach to disbursing knowledge restrict opportunities for creativity, limiting its role as a tool for development, and depriving the population of alternative possibilities of achieving social integration and thus of laying favourable plans for the future.

I shall now try to explain the seeds of school violence with regard to each one of the above-mentioned fields of social violence.

ECONOMIC VIOLENCE AND THE SEEDS OF INJUSTICE, MARGINALITY AND EXCLUSION

This topic is related to the way education is imparted to the Colombian population in terms of coverage, retention and relevance, aspects which are themselves directly related to the quality of education. Any failure to fulfil these functions will sow the seeds of marginality, exclusion and inequality, with the effect that no educational avenues are available to tackle the problem of poverty, which opens the way to an increase in social violence.

An education system which is unable to cover the whole of the population it serves is a discriminatory, exclusive system opposed to equal opportunity. Such a state of affairs may be the consequence of various factors.

Firstly, the physical inability to cover the whole of the national territory with a minimum of acceptable facilities. While there is no doubt that coverage has increased and the minimal target of basic education has been raised several grades higher, the system has not yet met all the objectives. According to data from the National Household Survey of September 1992:

> In the first place, as an approximate indication of coverage, attention is drawn to the high percentages of non-attendance at school among the poorer sectors of the population compared with higher income groups.
>
> In primary school, quintiles 1 and 2 show percentages of 21% and 14% respectively, while in the higher income quintiles the proportion is 4%. This means that, while universal coverage has been achieved in the higher income levels of the population, there are still difficulties in providing access for the poorer population groups.
>
> In secondary school, coverage is still low. The percentages of non-attendance at school exceed 40% in the lower quintiles of the population, almost double those observed in the higher income quintile (24%). In this case, the population group with no access to educational services is fairly large.
>
> In the second place, low coverage is noteworthy at all levels. For the population aged 6 to 12 years old in primary school, for instance, coverage is only 74.9%, which is very far from being universal at that level. Much depends, however, on the age range chosen in arriving at the coverage figure. The situation of the 13 to 19 age group in secondary school is even more alarming, where net coverage is only 48.4% (FEDESARROLLO, 1993, p. 15–16).

A second factor is the difficulty in retaining the population which enters school. This is due to many reasons, among which we may mention: opportunities which are not competitive compared with others available in the environment where the school is situated; exclusion due to difference; the lost earnings implied by supportng schools in situations of extreme poverty; and exclusory academic and disciplinary mechanisms. This is confirmed by Loera & McGinn (1995, p. 15):

> In the diagnosis given in the Educational Opening Plan, it is stated that, despite the fact that over 90% of school-age children enter first grade, 40% of these do not manage to stay on for the required five years. One-third of those who do stay have repeated a grade, since their age is above the normal estimate.

In other words, exclusion from school, because of problems of either coverage or retention or for any other of the reasons indicated, amounts to a denial of possibilities and opportunities for part of the population, which is liable to constitute a seed of social violence.

The quality and relevance of education may be understood as the effect of the interaction between the overall education plan and what is offered by society, in such a way that the former should appear modern, appealing, useful, essential for constructing students' careers, necessary for their social integration and generating possibilities for personal and social development. If this interrelation—between educational supply, society's needs and development opportunities for children and young people—falls short of the requirements, the students will enter school with the idea of fulfilling an obligation, but with the sure feeling that it is doomed to failure. As two young people put it:

> we are fed up with going to such boring classes. The teacher doesn't make them attractive; he doesn't get us at all interested (Camargo Abello, 1994, p. 26).

> It is all really tedious and remote. Why do we need so many subjects? (Camargo Abello, 1994, p. 33).

Research has queried the relevance of basic education by trying to pinpoint its social function. Is it to prepare youngsters for work? To be a channel for social advancement? To inculcate civic values? To transmit knowledge accumulated by mankind? To promote creativity, a critical spirit and a scientific attitude? To reconcile the ambitions of individuals with those of society? The failure to live up to these requirements, or to see clearly what functions are being accomplished, while at the same time generating feelings of boredom and failure, again leads to sowing the seeds of violence, since youngsters become burdened with impossible dreams, expectations and hopes. As a result of a perception that the education system is failing to promote and to achieve its assigned function, one notes the appearance of intentional exclusion, a feeling of despair with regard to the future and difficulty in finding alternative areas for development within society.

As a consequence, either because of deficient coverage or because of the irrelevance of the education that is offered, further impetus is given to the germination of the seeds of social violence.

POLITICAL VIOLENCE AND SEEDS OF INTOLERANCE, INJUSTICE AND ANTI-DEMOCRACY

These are directly related to the prevailing social structure and the social order. While the formal education system responds in part to the structure of the society in which it functions, it does, at the same time, have the capacity to construct alternatives for that society. The absence of civic participation, which is society's political ideal, can give rise to social violence and can affect the school. But there is a danger that the education system itself may, in turn, encourage conceptions and practices which inhibit democratic political goals if civic values, such as recognition of others and justice, are not respected.

To illustrate this point, we may quote the comments made by the disciplinary co-ordinator of a college:

> The object of today's meeting is to analyse the behaviour of students in the college. We may start from what is stated in the code of minors, namely that expulsion is not allowed. The college cannot and must not expel. We still have two weapons in our armoury, however: one is to persuade those responsible to withdraw the student; and the other is to reserve for ourselves the right of admission in the following year. A lady teacher interrupts: 'Like in the discotheques.' The co-ordinator confirms: 'Yes, like in the discotheques. If they can do it, so can we!' (Cajiao Restrepo, 1994, p. 80).

Seeds of intolerance

The seeds of intolerance are sown in the course of verbal interaction[3] whenever the message this conveys expresses a contempt of differences, exclusion, pejorative statements, insults, aggression and rejection. This type of seed can generate conceptions of society and of social relations expressing disregard for others, intolerance and inequality, but which can also inhibit healthy, balanced personal development. The seeds of intolerance appear in the course of school interactions, through a teacher's mode of teaching, through the students' resistance to the teacher's authority and to that of the school, through a lack of concern for the teacher by the community and through relations between peers. These are some examples:

> Once we were doing agriculture, when break rang and I went to wash my hands. The teacher called me a 'dolt'. I did not like that (Parra Sandoval et al., 1992, p. 203).

> It seems that what offends children most is expressions of rejection such as: 'you keep out of this; you are crawling with lice, you are covered in flea bites and you stink of urine. And what about you, you squit, what are you laughing about? Mind your own business!' (Parra Sandoval et al., 1992, p. 306).

From the teacher to the pupil. The basic message conveyed in this case is a description of traits, shortcomings and defects which, far from being made to appear human and subject to improvement, are portrayed as basic 'flaws' which the students have to put up with for the whole of their school career. Any occasional omission, error or poor performance degenerates into a personality problem giving rise to a loss of self-confidence, security and self-esteem. There are many ways in which this expresses itself:

- *Detrimental remarks directed at the pupil,* either in public or in private. On the one hand, a form of behaviour becomes a personality problem; for instance, anxiety, lack of discipline, disobedience or poor academic performance turn into problems of aggressiveness, hyperactivity, dyslexia, inability to concentrate, or unsociability, which require special treatment unless the youngster is to bear the burden throughout his school career. On the other hand, any act can carry with it a total psychological involvement, so that some infringement or mistake at a given moment and in particular circumstances may meet with reprimands which affect the whole personality of the student, reaching beyond the act itself and without any further

possibilities of explanation. Thus, failure to perform a particular task implies being unable to concentrate; untidiness in one's desk leads to being called an untidy person; it is not a question of 'behaving' in a particular way, but of 'being' one thing or the other. Here are some eyewitness accounts:

Felipe, a child in the fifth grade of primary school, came to the infirmary looking quite pale, with rings under his eyes and a violent headache. When they saw him arrive, some teachers standing nearby used expressions such as: 'Of course, since he doesn't want to work, he pretends to be sick'. 'He's not sick at all; this is just to cause trouble and to get out of class'. 'He is so dumb you needn't pay any attention to him' (Reina et al., 1991, p. 57).

When a girl put the coat of her uniform over her school pinafore because she was very cold, a teacher shouted at her from the rostrum: 'You, girl! Are you stupid or something? Take that coat off immediately' (Cajiao Restrepo, 1994, p. 155).

- *Anti-educational reprimands*. Drawing attention to mistakes in a negative and non-educational manner, as if making a mistake was something reprehensible rather than an act susceptible to correction and improvement; ridiculing a child in front of his/her comrades, because of difficulties, errors or omissions in the learning or disciplinary process; humiliating and insulting the child. This is confirmed in the following accounts:

The teacher comes back annoyed. 'I gave you this job half an hour ago and you still haven't done it! Look how bad your writing is! Hurry up! I'm going to rub it out! What is the matter with you? Get a move on, child! And you (pointing to another child), go to the back of the class!'. After a while, the same child is pulled by the ear to the front of the class where, kneeling on the floor, he is supposed to get on with his writing (Parra Sandoval et al., 1992, p. 39).

'This is the limit! It's as if the blackboard had got your tongues. Come on, think for once, if you have any brain at all. Of course, it seems you haven't' (Parra Sandoval et al., 1992, p. 173).

- *Constant scolding*. The education system uses scolding as a form of teaching, quite systematically in normal discourse concerning all types of activity; scolding can become a way of explaining, assessing, correcting or reprimanding for some disciplinary or academic fault, of warning about abiding by the school rules and requirements, of attracting attention or of working. In other words, scolding is part of normal, daily relations with students (Parra Sandoval et al., 1992, p. 19). This is clear from the following anecdotes:

Teacher: 'Let us talk about Chibcha culture ... how they used to live ... Quiet, let me talk! ... how they used to dress, whether they were used to a cold climate... Keep quiet! Keep quiet! ... what language they used to speak... Don't all speak together! Listen, you have to talk in turns, only when I ask you! Caicedo!... Martínez, keep quiet! López, come to the map and the rest of you make sure you can see. Give me a ruler. Quiet!... This business of the Chibchas is very important... Quiet! Quiet!' (Lozano & Cajiao, 1995, p. 127).

Good morning, children. Now, we are going to do the eight-part exercise that you know already. Now, let us get a move on, we don't have all day. You, Javier, wake up! Don't you

see what the others are doing? They have been coming to school for so many years and they still don't learn! ... Now let us see if you are awake today. You seem to get lazier and lazier. Your performance this year has been very poor, and this is why your parents have been saying that you don't learn anything here. Of course, we always get the blame, but nobody asks what you are up to. You don't study, you only want to play. When you get home, instead of saying 'Look, Mummy, at all the homework I have to do.' No sir, you throw your satchel down any old where and then go out to play. And here we are doing everything we can. No, if you don't want to study, then you should tell your father the truth: 'No, Daddy, I don't want to study any more; I don't like it; I would rather stay here.' Just tell the truth and don't make us waste our time; this is why I tell you: 'take advantage'. There is nothing cheaper than public schooling (Parra Sandoval et al., 1992, p. 168).

- *Classifying or typifying students*—into good and bad, fast and slow, disciplined and undisciplined—generates discrimination and produces a Pygmalion effect, since the student ends up behaving and acting according to expectations. This finds expression in the following examples, first in the image a student has of himself/herself and then in the ineffectiveness of scolding directed by the teacher at a pupil whom he/she is constantly reprimanding:

The teacher has quite a struggle with me, because I am not like the others; I make a mess of my books ... and my teacher gets angry; she scolds me; she starts to kick up a fuss and then writes notes in my exercise books (Lozano & Cajiao, 1995, p. 140).

Have you finished, Manuel? I'm only waiting for you now! At what time is your Mummy coming? If she is not coming, you can go home. And look at that fatty at the back who is really aggressive. You only have to look at her to know what she's like. 'Manuel! Manuel!', the teacher calls, which is really useless, because in fact she is concentrating on another child, who has written nothing in his exercise book. She takes him by the arm, sits him in the front row and orders him to start writing by tweaking his ears (Parra Sandoval et al., 1992, p. 42-43).

These forms of verbal interaction emanate from the teacher or school authority and are directed at the student, in whom they produce feelings of defencelessness and may lead to an inability as a person and as a student to confront challenges with any chance of success. Constant exposure to conduct of this kind permeates both relations and attitudes towards the relations, thus sowing the seeds of violence. Silence, submission, low self-esteem and insecurity are expressions on the part of students which could confirm the perception that their submission in school is achieved by remedial action marked by psychological and social aggression. Some children made comments like these about an authoritative teacher:

- My teacher is really bad-tempered; all he likes to do is yell. Often, by the time I leave school I have a real headache.
- It makes me feel really angry; sometimes I don't like coming to school.
- Sometimes, when I get to school, I just pray that the teacher won't come.
- I think that he is a really bad person, that he doesn't like children (Reina et al., 1991, p. 62-63).

From the pupil to the authority of the teacher. Boys in particular tend to resist and rebel against a teacher's authority and to insult and attack him/her. As a group they defy authority, ignore it, deny it any credibility and reject arbitrary practices of obedience and submission. This finds expression in insults, obscene language and violent, cynical and defiant replies which magnify the problem. Here is some recorded evidence:

A third-grade pupil is given the mark 2.5 in his nature study examination, which causes him to initiate the following dialogue with his teacher:
— 'What is each question worth?'
— 'One point.'
— 'Then I am entitled to a mark of 3,' comments the pupil.
The teacher reacts to the pupil's complaint, looks at the exam paper, checks it again and says:
— 'Your reply to the second question is only half right and is worth half a unit.'
The student, who is not satisfied with the reply, becomes annoyed and says:
— 'The fact is you don't know how to mark papers.' And shouting, he adds: 'You really hate me, you son of a bitch!'
— 'What? Say that again!'
— 'Son of a bitch! Son of a bitch!'
— 'Leave the classroom!'
— 'No, I won't.'
— 'If you won't go, I'll take you.'
— 'Then come and get me.'
The teacher goes up to the pupil, takes him by the arm, and drags him away saying: 'Now you go home and come back with your father, do you understand? You rude, vulgar boy!'

The next day, the boy's father goes to see the teacher, talks to him and then beats his child with a strap, saying: 'This is so you learn to respect the teacher; when did I ever teach you rude language, you insolent boy?' (Parra Sandoval et al., 1992, p. 61–62).

I think that some teachers are not really strict in school, because they are afraid of being threatened by their students or by gangs outside the school (Lozano & Cajiao, 1995, p. 103).

Students among themselves. This takes the form of nicknames, many of which are related to the person's outstanding physical features, family background, psychological characteristics, skin colour or social class. It is not easy to become accustomed to this student dynamic when, in many cases, the nicknames are either offensive or discriminating. In the same way, children and young people can attack each other verbally on the basis of some knowledge of the other's parents' or relatives' behaviour, so as to produce a feeling of exclusion on the part of the person attacked. The following was recorded in an educational establishment:

The son of a high-placed politician has a birthday; his classmates greet him with the familiar sing-song: '*sapo verde* to you ...' ('greeny toady to you', instead of 'happy birthday to you') ... and they go on chanting 'prosecution eight thousand, prosecution eight thousand ...' The birthday boy feels more and more harassed and cries: 'Stop pestering me!'. (Prosecution eight thousand is a case brought to investigate the drug cartels.)

From the community of parents to teachers. On some occasions, disagreements with the way teachers treat the pupils—their children—or demands that they should act in accordance with particular criteria or procedures, result in verbal aggression, which, as in the case of the students, tend to bring about a loss of authority and credibility among the teachers, as well as new moral and ethical codes of relationship with them. This is the story of a mother who had been asked to appear at school in order to be told about her son's behaviour:

One of the students, annoyed at being scolded, reacts by taking a bucket of water and throwing it at the school mistress' feet.

The mistress takes him to the principal's office and the principal sends him home, telling him to come back with his father.

Half an hour later, he comes back with his mother, who angrily goes up to the mistress and, in a contemptuous tone of voice using vulgar language, criticizes her attitude in sending the students home and her inability to punish the child in school, adding that in school the children are not taught good behaviour and respect, because they are very aggressive and violent and rude in school and in the street. In the end, the mother starts hinting to the mistress the kinds of punishments and penalties she should apply to the students (Parra Sandoval et al., 1992, p. 62-63).

SEEDS OF INJUSTICE

This is understood in the sense of violations of human rights and the deficiency, unsuitability or total lack of forms of justice which can adequately resolve conflicts in the education system. It is a means whereby wrong ideas can be transmitted in school about the rights of the individual and about justice.

With regard to the violation of human rights, cases of physical aggression also occur in school, such as the deaths of teachers, which are more frequent than they used to be (the late 1980s and early 1990s were critical years), threats, intimidation and threatening letters (*boleteo*) addressed to the teacher to force him/her to follow a particular line of conduct. The following comment has been made in this respect:

In the last ten years, being a teacher in Colombia has become as dangerous as being a soldier, policeman or journalist. On average, one teacher is killed every fifteen days. There were years, such as 1988, when there were as many as fifty-six deaths, more than one a week. This year, 1991, the death count reached 30 by 10 August when a gang of assassins murdered Hernando de Jesús Restrepo, rector of the Instituto Educativo América in Medellín. A similar fate was met this year by ten other teachers in Antioquia: either riddled with bullets in the street or even in the classroom or killed by a student carrying a gun. In many cases, those involved were lads who had been acting as hired killers until their crimes stopped producing any money and their parents forced them to go back to school. But they still remained convinced of the power of violence and they applied it against the teachers to force them to give them good marks. Some teachers, who ignored the threats, have been murdered in front of their own class (Restrepo, 1991, p. 8).

With regard to justice, it is not a good idea for the school to resolve conflicts by resorting to physical ill-treatment or by using corporal punishment in order to rectify the students'

behaviour, punish them or warn them about infringing academic or school rules. This physical ill-treatment takes the form of violence against parts of the child's body, such as pinching, pulling ears, arms or hair, hitting with a ruler, shaking, etc. Apart from giving rise in the students to a whole series of feelings of rage and revenge against the aggressor, physical aggression gives them the wrong ideas about authority, justice, participation and equality, a mental build-up in which the school is necessarily involved. As one student put it:

The mistress used to get us to copy from the blackboard and I would practically always get some of the words wrong. She would then yell: 'Go to the blackboard and copy the words properly!'. I used to feel afraid and was slow going up to the blackboard. She would then come to where I was sitting and drag me out, saying: 'Go and write properly on the blackboard'. I would go up, feeling a little nervous, and if I did not do it well, she would come back and shout at me: 'When are you going to start writing? Look, this is how you do it', and she would write in big letters on the blackboard. But as I was afraid, I used to make mistakes, and then she would start pulling me by the ear or seizing me by the arm and yelling at me: 'Listen, girl, you just don't want to learn.' Then the other children would laugh and shout: 'She doesn't know how to do it, she doesn't know how to do it!' (Lozano & Cajiao, 1995, p. 71).

In addition, the teachers attack the students through the parents, by transferring their educational responsibility in terms of reprimanding, punishing and overcoming the academic and disciplinary problems of students. The parents, placed outside the school setting where the fault was committed, may be doubly strict in the way they punish their children. However, resorting to the parents is not a teaching tool which can educate the pupils, but a violent, coercing and threatening instrument which can turn into the beginning of or extend ill-treatment in the family:

Gustavo Adolfo, a pupil. Too busy running, he fails to stop in time and ends up in front of another child. Just at that moment, the school principal is watching the scene. He runs over and drags away Gustavo Adolfo, saying: 'You are suspended because you have obviously forgotten that you are not allowed to run here'. Gustavo Adolfo begs him not to suspend him. The principal, indifferent, says: 'Go and bring your father and I'll tell him that you are suspended, if you are not too afraid' (Cajiao, 1994, p. 133).

Rosa, a teacher, tells the following story: Yesterday, in my classroom, my fine pen disappeared. I looked on the floor, in the desk, everywhere, but couldn't find it. I asked the children if anyone had seen my pen. They looked at each other, but no one said anything. I then got angry and I told them: 'If, in five minutes, my pen doesn't reappear, I'll search each of you in turn and whoever's got it will be sent to his mother. It seems unbelievable that with such big pupils one has to keep an eye on one's belongings' (Lozano & Cajiao, 1995, p. 45).

This anecdote shows how the school system fails to find the means in dialogue, arguments, agreement and conciliation of resolving differences of opinion, infringements of the rules or the non-fulfilment of explicit or implicit obligations. The result is the appearance of punishments and physical aggression, unfounded judgements, undeserved recrim-

ination, judgements handed down without any opportunity for recourse, rules which the students flout and sanctions which are 'skipped', a parallel system of justice and a lack of mechanisms for regulating social relations (social sanctions). All of this is related to the breakdown of school justice.

Lastly, acts of aggression take place among peers outside the school and unbeknown to the teachers or simply ignored. Coercion, the use of force, intimidation and blackmail to compel particular forms of behaviour, mobilizing group membership and seeking acceptability are common practices among students. Similarly, the existence of gangs of delinquents and confrontations between individuals or groups within the school may occur without there being any ways of resolving such conflicts. What usually happens in such cases is that either they are ignored or the students are expelled. Here is an illustration:

> Paco does whatever he likes, even with his fellow students. They say that when Paco becomes crazy, as they call it, he is really frightening and they are afraid. One day it appears that he took out a gun in the classroom to threaten a girl and take her tennis shoes. The poor girl preferred to leave the school, but she never told anybody and no one was able to find out what happened. The fact is that Paco held her up at gunpoint as she sat at her desk in the classroom (Lozano & Cajiao, 1995, p. 97).

In short, examples of learning about submission, about the use of force when exercising authority, about acting arbitrarily to deal with disobedience, about rejecting what is different, about scorning life, about taking the law into one's own hands, all occur in school and turn into the seeds of violence:

> I have really managed a great deal this year with my students. How they've changed! They are no longer fidgety, rowdy and playful. They know how to obey, thanks to me. This year, I really put them through their paces and now they are tame. I am absolutely certain that you have to be tough with the boys, so as to establish a proper respect and to make them into good students ... now they have learned how to be obedient (Cajiao Restrepo, 1994, p. 64).

THE SEEDS OF NON-CO-EXISTENCE

These are present in a subtle way in the education system, as they are part of its institutional order. They are related to the statutory framework and to the rules of the game according to which school life and interactions between its participants unfold. Rigid and authoritarian methods of organization and administration in school become yet more ways of learning violence and hence upset its hierarchical structure, its forms and channels of communication, its rules and regulations, its criteria for co-existence and the rules governing relations between individuals.

In the first place, on an *organizational* level, the failure of the education system to adapt to modern times, its pre-modern character in terms of backwardness, failure to keep up with the times, organizational inflexibility, the rigidity of its statutes, rules and principles, and the difficulties encountered in introducing any changes in the patterns of organization and management render it particularly incompatible with the community it serves, producing imbalances and conflicts which cannot be resolved by the school system. In the words of two young students:

I think what is wrong with the rules and with the school is that they are retrograde, because this school is old-fashioned (Camargo Abello, 1994, p. 22).

I think the rules are good, because they educate us as individuals; but there are some things that are very old-fashioned and which should be reformed (Camargo Abello, 1994, p. 22).

In the second place, from a *normative* point of view, the education system's aim and practice of seeking uniformity, in so far as this is its predominant institutional trait, makes it particularly incapable of taking differences into account, often leading to acts which are out of context, others which are exaggerated and yet others which are irrelevant for the population it serves. What is a basic necessity of the institution's social and organizational order appears arbitrary to the students owing to the way it is exercised and the priorities it establishes. Here is one example of a disproportionate response to compliance with a rule:

then Paco began to pester his classmates. For instance, if he didn't have a uniform, he would shut one of his classmates in the toilet and say: 'Give me your uniform, because I have to wear a uniform to go and see the rector or the co-ordinator'. He would threaten him and quietly put on the other one's uniform, without feeling any qualms at all (Lozano & Cajiao, 1995, p. 97).

Thirdly, from the *arbitral* point of view, social interaction is restricted by the dynamic of conflict settlement in the school, owing either to its disregard, its obsolete mechanisms or its vertical structure, as a result of which the learning of the schoolchildren is also to some extent arbitrary and anarchic. We may consider the following case:

Two girls were the victims of anonymous threats and were quarrelling about a common boyfriend in whom they were both interested. They also attacked each other physically and verbally on the way out of school and it was reported that on earlier occasions they had also been involved in fights, entailing verbal and physical aggression, both inside and outside the school. One of them threatened to call for help on the gang outside the school. They were taken before the disciplinary board, where the co-ordinator said: 'Don't try to be friends; keep to your own classrooms; here in school we don't go in for social life; it's not a club. And here we don't go in for love matches. Your behaviour has been recorded in the book and you will remain under observation; you are punished for one day' (Lozano & Cajiao, 1995, p. 87-88).

Fourthly, through the *repressive effect* of rules and in order to maintain the social order, the school limits expressions of emotion, spontaneous feelings, desires, interests, as well as the likes and dislikes of students, which are not essential for the school's organization. One example is the type of discipline imposed during breaks:

We watched the teacher walking around and telling pupils: 'Remember that the break is for you to rest; not for you to play and then come back to the classroom all sweaty and stinking.' We observed that the fifth grade children were getting ready to play in the football field. The teacher came up to them and said: 'Give me the ball; remember that you are not supposed to play because you bother the little ones with your blessed ball ...'. One of the children, the biggest, almost begging said to the

teacher: 'Come on, let us play. We won't kick the ball hard'. The teacher replied: 'I said no and please don't ask again.' (Lozano & Cajiao, 1995, p. 48).

It could be said that the co-existence ethic built up in the setting described above becomes discredited, thus helping to spread social violence. The students soon learn that the rules are meaningless, arbitrary, unsuitable in relation to the circumstances and the interests of the individuals involved, that they have a uniformizing character, lack relevance, are old-fashioned and are imposed from above.

VIOLENCE BROUGHT ABOUT BY BACKWARDNESS AND THE SEEDS OF DESPAIR

The transmittal of knowledge is the crucial aspect of school from the point of view of serving society and the modernization of the country. For the students, knowledge is a tool which can offer them greater alternatives for later life and finding their place in society. Not acquiring knowledge, on the other hand, may contribute to social violence through frustration, disillusion and despair.

The contact that students have with knowledge as proposed by the school will not help them build up ambitions creatively, either for their own lives or for the community, as long as the education system continues to favour dogmatism, rote learning and authoritarianism, all of which inhibit inquiry, questioning and a critical approach.

The present crisis in the education system, as expressed by the students in terms of its lack of relevance, its poor connection with life, the limited preparation it affords for work, its inadequate social training for individuals and its unattractiveness, is related to the academic side of the school system and not to the social experience which the students undergo within it, as confirmed by the following comments:

— The most important thing about school is my friends.
— I think school is fantastic, at least at the beginning. What is really great is the friends, the breaks and the things we do together every day.
— What I like best about school is having fun, my friends and having fun with them.
— I think that most of the time you go to school to learn to get on with others, not only to study, otherwise school would be boring, just study, study, study.
— Students come to school not to study but to have fun, to get out of the daily routine at home for a while ... to make friends and to have fun with them.
— Sometimes, it's the friends here at school that give you the courage to go on studying, because on your own, sometimes you say to yourself: 'No, I don't want to go back to school any more', and then the friends come and help you out with your problems. (Camargo Abello, 1994, p. 46).
— The school doesn't teach us what is most important, like developing ourselves in all areas of social life. For instance, they never teach us anything about sex, although it is well known that it is one of the most important areas of human life and one where there is most ignorance (Alzate Medina, 1995, p. 170).

And the crisis in education is directly related to the way knowledge is imparted in schools:

• Knowledge is a method of punishment and reproach, whereby students are obliged

to carry out tasks, are subjected to assessments and are told to learn lessons with a view to producing respect, attention and order. As one of the teachers said:

> I used to make them learn lessons by heart. I gave them lots of homework, especially at the weekend, so that they would also study at home and on Mondays I would test them, so that they had to spend more time studying than bothering other people and playing. If one of them did not spend enough time working, I would punish him during breaks or at the end of the day. Another punishment was keeping them away from physical education classes, which they miss a lot because what they most like doing is playing (Cajiao Restrepo, 1994, p. 83).

- Knowledge moves along a vertical, authoritarian path, based on the belief that the students have no abilities to find out for themselves and no knowledge, that the teacher knows and that students merely learn and do not think, that the teacher's views are always right, and on denying students the possibility of discovering for themselves, on ignoring their right to doubt and on disregarding their creativeness. According to one student:

> The teacher says: 'Let us do this', but he says it in a quiet voice and a minute later says: 'Let us do that' and then starts to go round and round in circles, and he is always writing one thing and saying another. And we get fed up with this because he doesn't look at us, but talks to the blackboard. He talks and talks and you just sit there day-dreaming. You can't ask him anything or say: 'I didn't hear', because he gets really upset and just glares at you (Lozano & Cajiao, 1995, p. 127).

As one teacher put it: 'Being a teacher means you have the right even to tell lies' (Lozano & Cajiao, 1995, p. 128).

- The repetitive and memory-intensive character of learning, disregard for any interaction with reality to generate new knowledge and new explanations, the gulf between knowledge and interest, denial of the possibility of creating, the priority given to information over explanation, the establishment of relations and understanding. According to one teacher:

> When they don't learn I fly off the handle; I go over it again and again until it sticks and then I test them with an assessment (Lozano & Cajiao, 1995, p. 73).

In the words of one of the students:

> Personally, I find it very hard to remain seated for so long, just looking at the same people. I don't like learning things off by heart, although I always have to, and I am no good at it; they teach you a lot of rubbish and if it is just to sleep in class, I would rather not go at all (Alzate Medina, 1995, p. 170).

- Knowledge lacking in meaning and relevance for students and even for the teacher. According to three young people:

> All the teachers want to do is to follow the syllabus and they don't care whether the students learn or not. They want us to memorize everything; for them that is teaching (Camargo Abello, 1994, p. 56).

> I don't care for school much because the type of teaching is old-fashioned. It should modernize itself a bit; they ought to change the classes and the way lessons are given; there are some irrelevant classes which ought to be abandoned for other more practical subjects (Camargo Abello, 1994, p. 42).

> Often he just gets us to read and doesn't explain anything, and when we ask a question he yells back at us, saying that we are already grown up and that we should know what we are reading (Alzate, 1995, p. 173).

The school, which is the cradle of democracy because it is the natural home of reason and discussion, is failing in its purpose because of dogma, knowledge imparted in an authoritarian manner and blind faith in the written word, absolute, final truths, unique explanations and preconceived ideas, leading to a rejection of diverse explanations of reality. In this way, it aggravates society's backwardness and no wonder that violence ensues.

Conclusions and alternatives

I do not consider that too much attention has been paid to the problem of intra-school violence. Quite possibly there is already sufficient information and documentation about authoritarianism in the school, dogmatism, backwardness and intolerance, and no more evidence is required to prove the full extent of these phenomena. But I still consider that research into their roots within the school is insufficient. What about the teacher's authoritarianism? How is it related to the teacher's idea of his/her profession and to professional identity? Why do educational institutions find it so difficult to accept alternative forms of organization? What prevents the regular updating of regulations, rules and handbooks? Where does the aggressiveness of children and young people originate? Why do young people tend to ignore and reject the natural authority of the teacher? Have boys' ideas of authority and their attitude towards the teacher changed, and if so how?

There is even less understanding regarding the connections between social violence and the school's working dynamic. What is the impact of violence on the education system? Could it be said nowadays that it reflects social violence, or that the school reflects the contradictions of the social order? Or is it possible that the school's effort of socialization based on knowledge and values makes social violence worse? If so, how? Or does the education system offset social violence by offering students a pleasant haven from what they experience at home? Is there a need to begin to recognize, delimit and find out about the causes of violence in order to be able to make a real contribution to their understanding and to the search for alternatives?

The school system needs to be opened up to research if these gaps in our understanding are to be filled. It has to be made receptive to the introduction of alternative forms of organization and interaction, whereby the school is situated in a setting marked by peacefulness, civic participation and the construction of a new ethic of co-existence.

Notes

1. 'A utopian world where people never raise their voices, where they all consume a regular amount of goods and services, where there is no anxiety, where television transmits only worthy, educational programmes, where there are no drug addicts, and where boys do not lay into each other is not only unfeasible but also inhuman' (Gaitán Daza, 1995, p. 183). Even if we agree with this statement, it does not prevent us from building utopias and making plans for a society based on equality, justice and a quality of life implying opportunities for all.
2. With the exception of the ethnographic studies carried out by Rodrigo Parra Sandoval and the Inter-institutional Project on the Quality of Basic Education (PIRCEB), financed by the FES Foundation, whose central theme is the quality of education and civic training (see references below).
3. The language used in school serves a functional and structuring purpose for relations taking place within the institution. For this reason, despite the fact that such language may appear very crude to an outsider, it does not have the same meaning for a social player living within that setting. The thresholds of tolerance in routine activities, where day-to-day existence takes place and is reproduced, are different, and, while they may change and a certain language or manner of speech may now be considered aggressive or insulting, there is no doubt that the same impression is not felt within the education system. I have therefore preferred to use expressions often considered to be 'rude' and even aggressive, because I consider that this is part of the general social environment, and I have omitted any reference to the way children and young people may deal with each other in a comradely and friendly manner.

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PROFILES OF FAMOUS EDUCATORS

WILLIAM HEARD KILPATRICK

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WILLIAM HEARD KILPATRICK

(1871–1965)

Landon E. Beyer

In the context of American education, William Heard Kilpatrick may be best known as a colleague of, and collaborator with, John Dewey, with whom he worked at Teachers College, Columbia University. Kilpatrick's development and advocacy of 'the project method' is another accomplishment for which he is widely recognized.[1] Yet the ideas, life and commitments of William Heard Kilpatrick go well beyond these relatively cursory understandings. In this essay, I describe and analyze some of the central features of Kilpatrick's ideas and activities, while trying to develop a more complete picture of this important figure in the history of progressive education.

William Heard Kilpatrick was born on 20 November 1871, the first child of the Reverend Dr. James Hines Kilpatrick and his second wife, Edna Perrin Heard; they were married on 20 December 1870. Before that marriage, Reverend Kilpatrick, a widower, cared for the three sons and two daughters who had been born to him and his first wife. The elder Kilpatrick had moved to White Plains, Georgia, in 1853, after graduating from Mercer University, with the express purpose of teaching in school. After teaching one year, however, he became pastor of the White Plains Baptist Church, a position in which he continued until his death in 1908. More than simply an influential member of the clergy, the Reverend Kilpatrick was a central figure in the political, civic and legal activities of this small agricultural town. Indeed, he is even said to have 'pulled teeth for anyone who came to his home'—a skill he had developed as the owner of a 1,600 acre plantation that included at least thirty slaves, an inheritance from his father.[2] His religious convictions, as well as

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his personal and temperamental attributes, were to influence William strongly, and even, in certain ways, to permanently shape his character.

Kilpatrick's father was stern, meticulous, serious-minded and essentially without humour. The Reverend Kilpatrick instilled in his son a commitment to detailed record keeping that would stay with him throughout his life. William kept a daily diary that in 1951 numbered some forty-five volumes, and wrote numerous letters to his family and friends. He also acquired from his father a penchant for clear, meticulous, well-developed thinking and the habits of hard, sustained work. As a result, William was widely known later in life for spending more time than most academics on his work activities; he often felt the pangs of guilt associated with commitments to teaching and scholarly investigations that took him away from his wife and children. He was also known, even as a young man, for wanting to become successful and a leader of some prominence. William also learned first from his father to speak out against inequities, and to express unequivocally even unpopular ideas about which he felt strongly.

William's mother provided a counterbalance of sorts to the stern, humourless demeanor of his father. 'Heard' (the name which she lovingly used for her first son) learned from his mother the value of a sense of belonging, while becoming self-secure and self-confident. Of his mother Kilpatrick said, 'she helped me early to learn not to be selfish, that I must give to others their just due; thus helping me early in life to balance the personal demands that might have been selfish against the rights and the demands of the other people.'[3] The relationship between William and his mother was apparently one that also helped fundamentally shape his dispositions and character—and even his teaching. He repeatedly attributed whatever success he had in teaching 'to the fact that [his mother] inculcated in him a "fine sensitivity" to people—not to hurt anyone no matter how lowly.'[4] It may well be the case that Kilpatrick's close, advocacy-oriented relationship with his students, discussed below, was prompted initially by that 'fine sensitivity' he saw in his mother.

William Heard Kilpatrick's first venture into higher education took place in 1888 when he enrolled in courses at his father's Alma Mater—Mercer University in Macon, Georgia. His experiences there, however, were less inspirational than they apparently had been for the Reverend Kilpatrick. Even as he began his junior year, William was without strong professional ambition and, in a larger sense, lacked a direction for his life. While he excelled first in ancient languages and then in mathematics, he had no firm sense of who he might become, having decided, like his brothers, not to pursue theological studies and become a member of the clergy. During his junior year, however, Kilpatrick stumbled upon a book that would have a long-lasting impact on his personal and professional life. Given the ideological contours of the strict religious household in which he had grown up, Kilpatrick had heard only that *The origin of species* was to be despised—a book which only wicked non-believers would take to heart.[5] Yet Kilpatrick's curiosity led him finally to borrow the book from a Mercer library. It proved to be a text that would shape in no small measure his general philosophy of education, and his own orientation to teaching. Concerning his initial reading of this work, Kilpatrick said,

> The more I read it the more I believed it and in the end I accepted it fully. This meant a complete reorganization, a complete rejection of my previous religious training and philosophy. By accepting

Darwin's *Origin of species*, I rejected the whole concept of the immortal soul; of life beyond death, of the whole dogma of religious ritual connected with the worship of God.[6]

Clearly, his exposure to the ideas in *The origin of species* was a monumental event in the young Kilpatrick's life. He understood well the repercussions his changed orientation would have on his relationship with his parents, especially his father. Yet there was an important sense in which William's moral convictions would continue in spite of his rejection of the religious creed that had been a part of his childhood. Foreshadowing his future commitments and activities, Kilpatrick noted that his denunciation of religion 'did not change in any way my moral outlook. I now had no theology, by my social and my moral life continued in exactly the same way.'[7]

After graduating from Mercer, Kilpatrick borrowed $500 from one of his brothers so that he might pursue graduate studies at Johns Hopkins University—an event that, like the reading of *The origin of species*, was to change the course of his thinking, and his life. Of his initial experiences at Johns Hopkins, Kilpatrick was to later say,

Even by breathing the air I could feel that great things were going on. I have never been so deeply stirred, so emotionally moved before or since. I had the feeling that here was the intellectual center of America. And I was eager to join this exciting new world; I too wanted to merge myself in this avid pursuit of truth. . . . This institution had the power to influence a youth of twenty beyond anything now known in America.[8]

It was Kilpatrick's discovery of the domain of modern, evolutionary science, and his attraction to open-ended intellectual inquiry at Johns Hopkins, that led him to reject the religious orientation he had acquired in White Plains. These educational experiences led him to embrace the ideas and outlook of modern science and to become committed to the pursuit of secular truth. Later studies in philosophy at Johns Hopkins would reawaken his interest in religious ideas. Yet that interest re-emerged as part of his larger search for understanding and clarity that philosophical analysis might provide, and not as some commitment to particular religious dogmas or practices of the sort that had shaped his childhood. Kilpatrick's fascination with science and inquiry helped provide that direction for his life that had been absent during his undergraduate days at Mercer. They also provided the impetus for many of his educational ideas, as he developed a philosophy of education that went beyond the individualism and the pseudo-scientific technicism of educators like John Franklin Bobbitt, Edward L. Thorndike, W.W. Charters, David Snedden, and others.[9]

After completing one year of graduate work at Johns Hopkins, Kilpatrick returned to rural Georgia to accept a position as an algebra and geometry teacher, as well as co-principal of the Blakely elementary and high school. Since he had taken no courses in pedagogy as a part of his previous education, Kilpatrick was required to attend a summer normal school session at Rock, Georgia. One of the events in which Kilpatrick took part at the summer institute that was to affect his own thinking in significant ways was a lecture on the educational ideas of Johann Heinrich Pestalozzi. This was perhaps his first inkling that a key to valuable education was the provision of meaningful, interesting experiences for students in which they could truly develop responsibility. Such an orientation

rejected the popular view that the key to learning lay in mastery of remote knowledge from a book, and in its connection to discrete and disconnected lessons, recitations and examinations. Within this dominant view, genuine understanding was less than essential, and perhaps even a hindrance to that 'toeing the line' rigidity that would ensure scholastic success. Instead, Kilpatrick saw the need to get students involved in things that were meaningful to them, and became committed to devising activities that would build on students' interests. Asked decades later about which ideas he was developing that first year of his teaching life that were to remain vital, Kilpatrick replied, 'it was trusting the child, getting him in on what was happening. I wanted each child to feel that I was trying to help him. . . . I wanted no division: the teacher on one side, the children on the other.'[10] Kilpatrick saw, during his early teaching experiences in Georgia, the importance of identifying with, and caring for, his students. Perhaps in part because of the nurturing relationship he had enjoyed with his mother, he could in later years remember virtually each of his former students, and enjoyed a fatherly relationship with many of them late into life. The provision of meaningful experiences for students that were connected to their intrinsic interests was more than a ploy to get students to pay attention or to complete assignments. It was rather the expression of a deep-seated commitment to, and respect for, his students as autonomous, self-directed people.

Another early influence on Kilpatrick's educational thinking was Francis Parker, who had studied the writings of Pestalozzi, Herbart and Froebel at the University of Berlin. Kilpatrick attended a lecture by Parker in 1892, and came to regard him as the first American progressive educator, as well as a forerunner of John Dewey. As Principal of the Cook County Normal School, Parker was able to help others recognize the value of a sense of experience in education—an emphasis that was continuous with Kilpatrick's commitment to providing meaningful experience for his students. Of his influence, Kilpatrick has said:

> Francis Parker was the greatest man we had to introduce better practices into the country's schools. I would now say that he took Pestalozzi's ideas and improved and enriched them and carried them forward. He preceded Dewey, but Dewey came along with a much finer theory, a much better worked-out theory.[11]

In spite of his clear devotion to teaching and to his students, Kilpatrick's central interest in mathematics continued, and led him to return to Johns Hopkins in 1895. That experience, in contrast to his initial studies there, proved to be disappointing in most ways. Yet, during that time he took a variety of courses in philosophy, which provided another seminal experience that opened new areas of exploration. Together with his commitment to science, inquiry and clear thinking, his exposure to philosophical ideas and forms of reasoning was to have a direct bearing on his understanding of education and teaching.

Kilpatrick's developing educational and philosophical ideas

After leaving Johns Hopkins for the second time, Kilpatrick in 1896 accepted the position of principal of the Anderson Elementary School in Savannah, Georgia. He taught the sev-

enth grade and was responsible for supervising nine teachers and upwards of 400 students. At Anderson Elementary, Kilpatrick was able to extend his view that there should be no division between the student and the teacher—that is, that there should be a reciprocal relationship between the two—and that students should know that their teacher is their advocate. Such a relationship, Kilpatrick had thought for some time, was eroded by the practices of grading students and sending home report cards to their parents. As a result, he convinced the superintendent to make an exception to the usual evaluation activities that took place at the Anderson Elementary School; no report cards would be sent home to the parents of students in Mr. Kilpatrick's classrooms. Parents did receive a note concerning their children's absences and tardiness, but no evaluation of their classroom work *per se*.

Summarizing Kilpatrick's orientation to teaching and to his students at the time, he said of his experiences at Anderson:

> The important thing is for the teacher to understand each child, so he can give him recognition for the good things in him; and so to conduct his class that every child has an opportunity to show off those good things which he can and is able to do. I treated those children with a kind of affection. I never scolded them; I never used harshness or reproof. I tried to teach so that the children could get some good out of it and in such a way that they could see they were getting good out of it. I trusted my children. I appealed to the better in them. I respected them as persons and treated them as persons . . . I appealed to the better in the children and I gave them an opportunity to act on that better self and then gave them recognition and approval for such behavior.[12]

Rather than searching for a 'system' to manage and regulate student behaviour—what we now call a 'classroom management' orientation that typically regards students as requiring manipulation and control[13]—Kilpatrick expected the best from his students, regarded them as people, recognized their accomplishments, and respected their interests while building on and enlarging their experiences.

Though he had planned to travel to Europe to study mathematics during the summer following his teaching at Anderson Elementary, the President of Mercer University told Kilpatrick that there was an opening for a professor of mathematics and astronomy at Mercer; Kilpatrick accepted an offer to fill that post, which began in 1897. While serving in that capacity, Kilpatrick met with prospective elementary school-teachers during weekly, voluntary meetings. For those meetings, Kilpatrick had his students read both Herbert Spencer and William James, among others. He also responded to students' expressed interests by expanding the readings to include works on philosophy, using texts by such figures as Plato, René Descartes and David Hume. In general, during his teaching at Mercer, Kilpatrick lived out his desire for sustained, demanding work, and considered favourably the idea that such activities would provide the framework for his life. He studied the writings of Nicholas Murray Butler, of Columbia University, and even had during this time a premonition that he would someday become the president of a major university.

At the end of his year on the faculty of Mercer, Kilpatrick enrolled in a summer school session at the University of Chicago. One of the courses he took during that summer of 1898 was offered by John Dewey. Contrary to what one might expect, Kilpatrick

did not think highly of the teaching of Dewey in this course. As Kilpatrick later confided, regarding his initial interactions,

> as I heard Dewey lecture, I thought of him as a very capable man. I honoured and respected him, but I failed to get from him the kind of leadership in thinking that I wished. Professor Dewey is not a good lecturer, and he does not always prepare the ground, so that a newcomer can follow him.[14]

Kilpatrick's feelings toward Dewey, of course, were not permanent. After studying and working with Dewey at Teachers College, Kilpatrick was to say that, 'the work under Dewey remade my philosophy of life and education' and that as a philosopher Dewey is 'next after Plato and Aristotle and above Kant and Hegel as a contributor to thought and life'.[15] High praise indeed!

Kilpatrick's studies with Charles DeGarmo, as part of a summer course in 1900 at Cornell University, were more inspirational that his first encounter with Dewey had been. Of DeGarmo's book, *Interest and effort*,[16] Kilpatrick remarked:

> This book opened up a whole new world to me, as no book ever before. No other book had ever meant as much to me. I was stirred and moved. It coalesced all my feelings and aspirations; it showed me that there was no conflict between interest and effort; that they were not divergent forces but that they were inextricably allied; that effort follows interest. In other words, the more an individual becomes interested in something, the more effort he will put into it. Hence, the starting point in all education—the crux of the educational process—is individual interest; further, that the best and the richest kind of education starts with this self-propelled interest.[17]

Building on his earlier ideas concerning children and the need for teachers to 'get them on their side', as well as to provide meaningful experiences and treat them as people with significant accomplishments, Kilpatrick saw the key role of interests in teaching. Students' interests could change, be connected to related ideas and further interests, and developed with the aid of a sensitive, attentive teacher. Such ideas were to become central to his general educational philosophy and to his views and practices concerning teaching.

Agreeing to teach algebra and mathematics classes during a summer session at the University of Tennessee in 1906, Kilpatrick—true to his workaholic tendencies—audited two courses taught by faculty from Teachers College: Percival R. Cole and Edward L. Thorndike. The latter advised Kilpatrick during that summer session to apply for a scholarship from Teachers College. Kilpatrick took that advice and started out for Teachers College, in the fall of 1907, with a scholarship paying $250 per year. While a student there Kilpatrick was greatly influenced not only by John Dewey, but by such professors as Thorndike, the historian of education Paul Monroe, Frank McMurry, and Dean James E. Russell. At least as important, at Teachers College Kilpatrick became immersed in an institutional culture that embodied and furthered the zeal for education he had developed, and one that made the study of educational ideas and issues respectable. In short, Teachers College provided the sort of stimulating, theoretical and practical, diverse environment that had been lacking at Mercer University and even, at least for the most part, at Johns Hopkins. It was an environment that shaped Kilpatrick's interests and substantially formed his life's work.

Kilpatrick's thought in maturity

Characteristic of Kilpatrick's efforts to understand ideas and practices holistically, and to come to grips with their significance in social and political spheres, he came to think of philosophy as helping to form a generalized 'point of view' or 'outlook on life.' In his *Philosophy of education*, for example, Kilpatrick compares democratic with dictatorial points of view.[18] He follows this by discussing the different educational agendas that follow from such basic political emphases.

> The autocrat [Kilpatrick says] wishes docile followers . . . Democracy wishes all the people to be both able and willing to judge wisely for themselves and for the common good as to the policies to be approved; it will accordingly seek a type of education to build responsible, thinking, public-spirited citizenship in all its people.[19]

While the particular analysis of political ideas here is rather superficial, it demonstrates the commitment of the author to seeing educational practices, ideas and philosophies as integrated with larger, in this case political, contexts. It is these contexts that educators often fail to consider when they discuss the meaning of educational actions and decisions, and when they make educational choices regarding the school curriculum and classroom activities.

An avowed commitment to democratic values and principles fundamentally underlies Kilpatrick's orientation to education and school practice. Like Dewey, Kilpatrick argued that the meaning of democracy extends far beyond issues and actions related to a government, and instead denotes a way of life that has both moral and personal consequences. For Kilpatrick, democracy,

> means a way of life, a kind and quality of associated living in which sensitive moral principles assert the right to control individual and group conduct. It is worthy of note that . . . democracy involves control, the control of both individual and group conduct for the good of all affected . . . [this] control is internal, the demand of intelligence and conscience upon the individual himself to obey and serve the varied calls of a social morality . . . [It is] always to allow expression of individuality as effectively as possible in all relationships.[20]

Clearly, for Kilpatrick, a democratic society must impose a number of constraints and responsibilities on its citizens. While individualism is selfish and egocentric in its orientation, individuality is to be valued in part because it may serve the interests of social critique and social change. The responsibilities to maintain individuality but constrain individualism must be the special concern of educators, whose activities will either advance or thwart democratic ideas and actions. In a genuinely democratic society,

> it is essential that both leaders and people have a clear philosophy of life and a clear philosophy of education. Any citizen then, who values democracy, who thinks much, feels deeply, and accepts responsibility for his acts will try to build a consistent and defensible outlook on life and on education. And the higher and finer the character the more likely will the person seek to build through the years a philosophy which has been thought out (so that he knows what values he stands for) and scrutinized for its defensibility (so that he knows how it affects the values of others).[21]

Going beyond the realm of political principles and actions, we can think of education in even more expansive ways, Kilpatrick says. All people, perhaps as a part of what it means to be human, have points of view or attitudes, or operate—whether consciously or otherwise—with the aid of particular perspectives. What matters in the development of such perspectives is the forms of reasoning, and the specific reasons offered, that help us make decisions about educational policies and practices. A basic question here is how teachers and others are to decide among competing points of view, and how they are to develop a rational basis for choosing among such views. There are several ways we might make educational decisions. We can, when confronted with a range of options, rely on generally accepted customs or the received wisdom of our time. Or we can choose those options with which we are personally most comfortable, or that are least disruptive to our way of life and presuppositions. Yet such 'choices' are not the result of conscious, reflective deliberations, and therefore are not really choices at all. Such ways of determining one's course of action are not philosophically defensible.

A more promising approach to making decisions in classrooms and other settings is to base them on the extent to which the resulting actions coincide with our expressed values. This, however, leaves aside the important prior question of what basis there is for justifying certain values rather than others, and substitutes instead a more or less technical orientation to making choices that is founded on consistency. The actions of a dictator may be consistent with his/her values, but they are not on that basis warranted. The process of making decisions itself can be critiqued, as when I ask myself if I have fully considered a comprehensive range of factors in making my decisions. Yet this approach, too, fails to consider the normative dimensions of both the choices we make and the actions which they promote and prohibit. In the final analysis, making decisions must, for Kilpatrick, be connected to the values my actions have, and ultimately based on such fundamental value questions as what constitutes the criteria for being good, doing good, etc. These are the very questions with which philosophy is concerned. Thus philosophy, and a philosophy of education, leads us to examine not only our values, but to search for more adequate values that can be examined and, if not 'proven,' at least rationally defended. The 'stubborn search for more and more adequate' values is what Kilpatrick identifies as philosophizing.[22]

Such a conception of philosophy makes clear its essential role for teachers.[23] A comprehensive philosophy of education should not only help us think through abstract issues and questions, but also help us make decisions about both general educational policies and specific school practices. In this understanding of philosophy, it amounts to something like a self-conscious, rationally defensible, orienting point of view that affects what people think and value, and how they act, in day-to-day situations and in all social institutions—including schools. Philosophy is thus associated with a range of possible outlooks or orientations, and is inherently connected to a range of political ideas and platforms. As Kilpatrick put this point:

> (i) any distinctive social-political outlook, as democracy or Hitlerism or Communism or reactionary conservatism, will wish its own kind of education to perpetuate its kind of life; and (ii) each distinctive kind of teaching-learning procedure will, even if the teacher does not know it, make for its

own definite kind of social life . . . [As a result,] school people—teachers, superintendents, supervisors—must ask themselves very seriously (i) what kind of social outlook their school management and teaching tends to support; (ii) what kind of social life they ought to support; and (iii) what kind of school management and teaching-learning procedures they ought to adopt in order to support this desired social life.[24]

In Kilpatrick's view, teachers and others involved with schools must have some perspective, some point of view that grows out of the development of a philosophy of one sort or another, which can serve to ground the various choices they must make.[25] Contrast this to a common contemporary perspective according to which what matters most for teachers and prospective teachers is 'what works' in classrooms, often understood as whatever maintains classroom decorum, raises students' standardized test scores, meets the standards of state and national accreditation and licensing agencies, or simply fits with accepted practices or the dominant culture of schooling. Asking teachers to become philosophers, Kilpatrick sees teaching as a social and political undertaking that requires our deepest, most comprehensive, clearest thinking.

This orientation to philosophy, obviously, is not to be equated with abstract metaphysical speculation or analyses that are removed from day to day life. Indeed, the activities associated with everyday living provide the arena for philosophical questioning and analysis, with the goal of leading a better life, having fuller experiences, and developing one's capacities for further growth. Such views are central to the pragmatic tradition that William James, Charles S. Peirce, John Dewey, and others articulated and that is still influential in contemporary educational debates.[26] In looking at Kilpatrick's views on what he calls 'the life process' and its relationship to philosophy, we can see the ways that *The origin of species*, discovered at Johns Hopkins, and modern science generally, are related to this pragmatic orientation.

As noted already, Darwin's book in some ways undermined older humanist traditions that focused on realities that were assumed to be changeless and eternal. With the publication of *The origin of species*, change became the basic fact of biological and social life. Such a perspective affected people's conception of knowledge, as well as their views on ethical and political practices. Two implications of this change are especially important for understanding Kilpatrick's views on education. One is that change is the constant, in individual and social life—something to be expected and anticipated, even prized, rather than viewed as symptomatic of some inadequacy and avoided. A second implication of the new scientific outlook is that action or behaviour within an environment becomes the key for the study of the 'life process' for both individuals and groups.

For Kilpatrick, an active, satisfying life involves striving, desiring, acting, or more generally what he calls 'purposing'. He emphasizes the importance of 'behaving', which for Kilpatrick has a much different meaning than the ideas associated with behaviourism. Consistent with his earlier fascination with the ideas of Charles DeGarmo regarding effort and interest, Kilpatrick says that behaving involves the response of an organism to a situation. That response often elicits 'wants' or desires that in turn create an aim or goal, followed by efforts to realize that aim. In the process of attaining that aim, people develop related interests and experience positive enjoyment. The key to understanding the 'life

process' is thus to be found in effort and interest, followed by further interest. In other words, the life process of human beings is intimately connected to interactions with social and physical environments in which our interest is peaked, resulting in the creation of desires from which we articulate an aim that is pursued. The life process is, hence, essentially interactive and social. The 'true unit of study' as Kilpatrick puts it, is 'the organism-in-active-interaction-with-the-environment'.[27]

It is within this context that we may understand more fully Kilpatrick's project method, as well as its justification. What is crucial within the project method is that there be some dominating purpose—which of course may not be observable—in which students whole-heartedly participate. Consider a boy who wishes to make a kite:

> the purpose is the inner urge that carries the boy on in the face of hindrance and difficulty. It brings readiness to pertinent inner resources of knowledge and thought. Eye and hand are made alert. The purpose acting as aim guides the boy's thinking, directs his examination of plan and material, elicits from within appropriate suggestions, and tests these several suggestions by their pertinency to the end in view. The purpose in that it contemplates a specific end defines success: the kite must fly or he has failed. The progressive attaining of success with reference to subordinate aims brings satisfaction at the successive stages of completion . . . The purpose thus supplies the motive power, makes available inner resources, guides the process to its pre-conceived end, and by this satisfactory success fixes in the boy's mind and character the successful steps as part and parcel of one whole.[28]

The project method, in unifying students' interests with action in the world and emphasizing 'the hearty purposeful act', provides one example of the way in which 'education' and 'life', knowing and doing, are continuous. Beyond this, the ability and determination to engage the world through such acts allows people to control their lives, and to act with care in bringing to fruition worthy activities; these traits, in turn, allow people to exercise their moral responsibility. Such a person, Kilpatrick remarks, 'presents the ideal of democratic citizenship'.[29]

Modern science, in dispelling the notion that there are invariant 'essences' that are central to understanding the nature of the universe, provided additional grounds for supporting the view that people must be seen in context, as well as grounds for valuing acts of purposing that are central to moral undertakings and citizenship. In promoting an interactive view of the universe according to which 'being' and 'environment' are two sides of the same coin, interconnected and mutually influential, we allow for people's actions in that world changing both ourselves and the larger world. While Kilpatrick mentions the technological advances made possible by modern science, he clearly thinks its cultural implications are more important, helping develop new outlooks on life and how we think, feel and act as a result. An interactive orientation leads to a new humanism with people rather than abstract essences at the centre, with a view toward the intelligent direction of affairs. Such intelligent direction was especially needed during the time Kilpatrick was writing many of his treatises, given the economic, military and social crises in which the United States of America was engulfed or that were about to develop.

Human activity in this view must be understood as actions-in-context, as enmeshed in environments that both affect, and are affected by, our actions. Among other things, this view denies the existence of autonomous individuals whose 'nature' is fixed and unalterable. The importance of the context of experience also runs counter to the deeply held assumption of 'radical individualism' that has been a central feature of Western industrialized nations.[30] Such a focus on individualism, Kilpatrick reminds us, is also inconsistent with the requirements for democracy. As he puts it:

> the essence of democracy is to be concerned about each individual and his welfare. This is regard for individuality or personality, not a belief in individualism. In individualism there is too much of each man for himself regardless of others, or even at the expense of others. Such an attitude true democracy cannot accept. On the contrary, democracy will test each social institution and program by whether in its working it makes for the welfare and happiness of each one of everybody, all together, on terms of substantial equality.[31]

The meanings of progressivism

By the time Kilpatrick retired from Teachers College in 1938, his ideas and activities had been widely discussed among academics and school-teachers. Kilpatrick continued to enjoy a reputation as a first-rate teacher and was therefore beloved by his students. As Herbert M. Kliebard has remarked, Kilpatrick became 'the most popular professor in Teachers College history'.[32] Further testimony to the depth of his educational commitments can be seen in the fact that Kilpatrick helped found Bennington College in Vermont, and served on its Board of Trustees for seven years. His social commitments are reflected in his Presidency of the New York Urban League from 1941 to 1951.

The educational ideas and orientations of Kilpatrick continued to be timely, even after his death on 13 February 1965, in New York City. A special issue of *Educational theory* was dedicated to Kilpatrick shortly thereafter in which several of his colleagues wrote movingly about both the man and his ideas.[33] Kilpatrick's personal love for teaching and the depth and popularity of his ideas concerning educational matters continue to be worth pondering. But his personal appeal and his particular agenda for American education are only part of the story.

What Kilpatrick makes clear is the depth of inquiry and the dedication to clear thinking that are necessary for all those concerned with educational matters. In addition, Kilpatrick's ideas—along with Dewey, and a host of others, now and then—continue to offer educational alternatives to the emphases on efficiency, standardization, control and manipulation. He offered a way to make learning and living really unified, and to change the nature of public school classrooms.

In recognizing the need for philosophical reasoning and reflection, and for underlining the political purposes and possibilities of education, Kilpatrick's ideas also continue to be pertinent. This is especially relevant for discussions that have taken place in the last few years, as many have struggled to reconceptualize democratic life, the democratic purposes of schooling, and the need to link those purposes with social and moral actions.[34]

Discussions regarding the possible role of United States schools in promoting a demo-

cratic social order are as old as attempts to establish a system of publicly supported education. From Thomas Jefferson's proposals for a system of schools in Virginia, to Horace Mann's call for school reform in the second quarter of the nineteenth century, to the report of the National Commission on Excellence in Education, to the recent recommendations of the Eisenhower Leadership Group, America's schools have been called upon to advance a variety of purportedly democratic purposes.[35]

One problem—both conceptual and ideological—that has repeatedly plagued discussions about schooling and democracy is that the meaning of democratic discourse, practice and values continues to undergo substantial, periodic revision. Curricular changes have, in fact, been initiated in an attempt to clarify or change the meaning of democratic life and the social and political choices that are consistent with it. Certainly Kilpatrick's ideas fit within such efforts at change.

Beyond the considerations outlined by Kilpatrick in this regard, a variety of contemporary interest groups and those in positions of power have suggested one vision of democracy or another that is consistent with their larger ideological agenda. Powerful segments of United States society affiliated with what has been called 'the conservative restoration'[36] and the 'Republican revolution' are attempting to reassert an agenda that caricatures or simply denies the existence of those progressive strands of democratic thought and practice which they oppose. Clearly, important conceptual and ideological differences exist among those urging that we adopt or invigorate democratic practices, values, and institutions. Understanding these differences is crucial if we are to articulate a vision of social possibility for schools. For making this point abundantly clear, we have a serious debt to Kilpatrick and other student-centred progressives.

Kilpatrick is insightful in clarifying how daily classroom decisions carry political import and meaning. As he makes clear, questions and issues regarding pedagogy and curriculum intersect with the political, moral and social domains of our worlds. Educational choices frequently respond to, and help reinforce, some set of values, priorities and perspectives that have the effect of furthering some interests while hampering others. Teachers as a result confront several difficult, complex issues: What values should guide the establishment of some kind of classroom climate? What modes of analysis, ways of thinking and kinds of experiences should be encouraged, which hampered? What attitudes and expectations should be encouraged or altered among students? What modes of interaction should be promoted or curtailed in the classroom? What forms of knowledge are most worth perpetuating? In short, for teachers there is no neutral place to stand, as decisions that are made everyday in classrooms—or, just as likely, made by others outside classrooms—support certain normative beliefs and assumptions, ideals and convictions. Such beliefs and assumptions must, as Kilpatrick says, be critically scrutinized and analyzed by teachers, and by those preparing to teach.

The normative dimensions of education differentiate teaching from most other professions. Even when their autonomy is constricted, teachers can influence the students in their care, and those students' futures, in ways that speak in the broadest sense to the political nature of teaching and schooling. In addition to 'providing a service' to the public, and beyond an obsession with 'the bottom line' that currently infects both the 'private sector' and an increasingly privatized neo-public one, teachers affect the hopes, dreams, atti-

tudes, and perspectives of their students, and because of that the future of the society in which they and their students live.

In this context, Kilpatrick's insistence that democracy is larger than the actions of government is critically important. In his words, democracy 'means a way of life, a kind and quality of associated living in which sensitive moral principles assert the right to control individual and group conduct'.[37] Democracy provides a moral and broadly social framework that has implications for interpersonal as well as institutional actions and decisions that must be made on a day-to-day basis. The way we live with each other, the way we treat one another in our daily interactions and relationships, is central to this understanding of democracy and its implications. Thinking about democracy as only a way of making electoral choices or instituting governmental policies allows undemocratic practices like those associated with inegalitarian economic and cultural practices seem outside the pale of democratic inquiry—as if a democratic critique of economic and cultural realities involves making something like a category mistake.

Beyond the crucial need for clear thinking, reasons for choices and action, philosophical acuity, and purposeful, wholehearted activities tied to interests, any sort of wide-ranging participatory democracy is only possible if we reinvigorate a sense of community. This in turn requires, and is supported by, a grasp of the possibilities for a common good, collectively decided by people engaged in open, moral discourse with others, within which a commitment to equality is central. We need a broadly based cultural vision for democratic practice in which daily activities and interactions, a search for the common good, the reinvigoration of community, and an openness to dissent and difference, mutually support each other, and allow for new forms of life and decision making to emerge.

A democratic community must, finally, enable people to develop values and ideas that outline alternative social possibilities. Equally important, such a community must generate concrete practices that enact a moral vision—a vision not reducible to any set of present realities and yet not simply an 'idealist' construction. A democratic community encourages its members to become participants in civic discussions that require concerted, collaborative actions in the name of social justice and structural change. Kilpatrick, like Dewey, understood knowledge to be the outcome of past and present human efforts to come to terms with the worlds in which we live. For progressives generally, as can be seen in Kilpatrick's 'project method', children are people who are, and ought to be, actively engaged in attempts to understand and become more skilful in the world in which they live. What is inadequately emphasized by many progressives, including Kilpatrick, is an articulated direction in which this educational endeavour should head. Early on, Counts criticized the progressive movement as lacking this sense of direction:

> If an educational movement, or any other movement, calls itself progressive, it must have orientation; it must possess direction. The work itself implies moving forward, and moving forward can have little meaning in the absence of clearly defined purposes . . . Here, I think, we find the fundamental weakness, not only of Progressive Education, but also of American education generally. Like a baby shaking a rattle, we seem to be utterly content with action, provided it is sufficiently vigorous and noisy. . . . The weakness of Progressive Education thus lies in the fact that it has elaborated no theory of social welfare . . . In this, of course, it is but reflecting the viewpoint of the

members of the liberal-minded upper middle class who send their children to the Progressive schools—persons who are fairly well-off . . . who pride themselves on their open-mindedness and tolerance, who favor in a mild sort of way fairly liberal programs of social reconstruction, who are full of good will and humane sentiment . . . who are genuinely distressed at the sight of unwanted forms of cruelty, misery and suffering . . . but who, in spite of all their good qualities, have no deep and abiding loyalties, possess no convictions for which they would sacrifice over-much . . . are rather insensitive to the accepted forms of social injustice, [and] are content to play the role of interested spectator in the drama of human history.[38]

When we add a more encompassing and fleshed out societal context to a progressive educational agenda, and a set of moral, political and cultural values that provides the direction Counts advocated, we have a more encompassing basis for articulating a direction for education.

This direction builds on the ideas of Kilpatrick and yet, in some important ways, goes beyond them. It is guided by a commitment to radical democracy as it may provide avenues for reconceiving social institutions and practices, guided by a populism in form, and dedicated to structural change. Such change may be brought about by a reinvigoration of communities in which genuine participation, moral discourse and the common good fuel actions in the world. Seeing the various components of our worlds as susceptible to alteration through collaborative actions that build on our sociability; articulating moral values in open settings in which dissent is expected and valued that can guide those actions; and altering hierarchical structures and inequalities that demean and disempower, and that deny liberty and opportunity, form basic elements of an enlarged progressive direction.

In this vision we bring together the child, the curriculum and the society. It is consistent with the emphasis on a progressive democracy founded on participation, moral reasoning, social justice and action in and on the world. It provides hope for those now harmed by the inequalities that continue to thrive and grow in the United States. It also offers hope for significant change in society and in classrooms where democratic values may be enacted.

For pointing to the need for educators to see their actions as embedded in, and helping further, social, political and philosophical perspectives, we owe much both to William Heard Kilpatrick and to the progressive tradition in which he was so influential. Especially in schools, where it is still all too common for students' interests to be squashed and their accomplishments ignored, the advice to get students and teacher 'on the same side,' and to create classroom environments within which the joys of genuine exploration can be felt, is critically important. To accomplish this, and to help create a social context of the sort that will allow the student to participate in similar ways as an adult, requires progressive political action of a somewhat more directed, encompassing sort. That action must be more attuned to the particular dynamics of the sort of society we have, and productive of a vision of what a better society would look like. How to get from the one to the other, and what that process implies for schooling and teaching, is perhaps the fundamental problem that must be confronted by contemporary educators who are committed to a new progressivism.

Notes

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