



Prof. Hans Geser
Online Publikationen

Universität Zürich
Soziologisches Institut



Sociology of the Internet

AOL-MIT or Humboldt redivivus?

The promises and illusions of virtual academic education

Hans Geser
University of Zürich
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“Once the very best physicists in the world sit down and create a physics course, there will be little use for local physics teachers.” (Schank/Jona 2000)

“Hätte ich unter den alten und neuen Unterrichtsmitteln ein einziges zu wählen, ich wählte Tafel und Kreide.“ (Hartmut von Hentig, 1984)

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1. On the functional polyvalence and generalized adaptiveness of digital media

Every step in the evolution of communication technology has the effect of increasing the range of alternatives communicating individuals have available, so that a broader variety of interpersonal interactions modes, cooperative processes and social structures (on the level of groupings, organizations and even entire societies) may unfold. In the realm of education, for instance, printed texts have brought the option of taking up information by reading books instead of attending lectures, and video technology has opened the opportunity to free the deliverance of lectures from the physical presence of teachers.

The major significance of the new digital media lies in the fact that they widen these alternatives so drastically that the range of new options cannot even be generally circumscribed (especially when further future advancements on the hardware and software levels are taken into account).

While concepts like “radio”, “television” or “cinema” refer to specific technical media with specific capacities and constraints (and therefore: with predictable consequences for individuals, groupings, organizations or society as a whole), these new technologies can only very generally be addressed as the “digital sphere”: encompassing the World Wide Web and the USENET together with more restricted networks (intranets, extranets LAN’s etc.) as well as digitalized TV and radio broadcasting, CD-ROM and DVD-media, video conferencing arrangements, cell phone and SMS networks, or satellites-based earth surveillance and global positioning systems.

As all sorts of information (sounds, word, pictures, videos) are transformed into an identical binary code, they become part of a single, coherent “digital universe” because they can be processed by the same hardware and software systems and easily be transposed from one form to another.

Thus, the traditional separation between unilateral diffusion media and interactive two-channel media breaks down, and the separation between private, organizational and public spheres threatens to erode because their technical permeability is so high that they can only be kept apart by highly sophisticated technical procedures (e. g. firewalls and encryption).

Talking about the “digital media” thus means: talking about a highly generalized “public utility” which supports all possible modes of information processing: (bilateral and multi-lateral, private and public, written and oral, one-way and two-way, synchronous and asynchronous etc.).

Given this functional universality, the digital media are the purest “media” in the sense that they provide smoothly adapted technical support to any kind of communication processes without shaping or even distorting them by any intrinsic properties. As a consequence, uses made of computer-mediated communications vary dramatically according to the specific values and purposes in a given “community of practice” (Wenger 1998), so that

“a democratic organization will use CMC to help de-centre its decision making processes while an autocratic one will use the network to increase surveillance and central control over the employees.” (Mantovani 2001).

Instead of “learning *from* media” (like books, videotapes etc.), this new mode of “learning *with* media” implies an intimate reciprocal relationship between technology and individual which unfolds and evolves in ways not predictable or controllable by outside authorities and rules:

“...this research with technology focuses on how human processing changes in distinct, qualitative ways when an individual is engaged in an intellectual activity using the com-

puter as a tool. Taken interactively, an intellectual partnership is formed between the individual and the technology; the resulting changes to cognition cannot be understood when the individual or the technology are considered apart" (Hannafin, Hannafin, Hooper, Rieber, & Kini (1996)

In direct contradiction to Luhau's saying that "*the media is the message*", the digital media system is much too malleable to be a significant *factor of causation*. Instead, it can be better considered as a *factor of indetermination*: by increasing the range of communicative options so much that it cannot be predicted who will choose which alternatives how often under what circumstances.

By empowering individuals as well as collectivities, organizations and whole societies to realize their own preferences, the digital media are likely to amplify any kind of divergences already existing on the psychological, social or cultural level.

As highly generalized tools adaptable to any purposes and circumstances, the new media exert no causal effects by themselves: so that looking at their intrinsic properties does not inform us about their impacts on specific groups, institutions or society as a whole.

Instead, it is indispensable to study the specific purposes and goals pursued by the relevant users and the particular cultural background, social constraints and environmental circumstances under which they are actually applied.

Thus, only by taking into account the basic institutional characteristics and conditions under which universities currently operate, specific hypotheses about their openness or resistance vis-à-vis the new media, about the most likely courses of virtualization they will pursue, and about the probable impact of these technologies on future academic teaching and learning, can be formulated.

2. On the intrinsic conservatism and polymorphism of modern academic institutions

Comparable to the Catholic Church, universities belong to those very few institutions which have successfully survived since the Middle Ages without changing their location and names, their fundamental activities and goals and their basic way of functioning within society (Kerr 1992). Despite the immense changes in culture, society and technologies (to which they have themselves very much contributed), they still retain highly traditional norms and procedures, particularly in their methods of teaching:

"Universities have been extraordinarily durable as institutions and in terms of the functions they have performed in Western societies. They have even been durable in their methods of instruction. The lecture, the lectio, of the medieval university is still with us, as is the disputation, if in the less structured and vastly more secular format of a seminar.

And we are still employing essentially the same approach that enticed students from all over Europe to Bologna as early as the 12th century. We expect students to travel to a physical place (often many countries away) where they will find a set course of more or less tightly integrated studies based mostly on lectures and seminars by recognized experts" (Casper 1995).

Since their inception the 12th century, universities have been very resistant to make use of any explicit and systematized pedagogical methods for improving their main task: the transmission of knowledge. Never have professors been obligated to attend training courses in order to increase their empathy to students and to upgrade their didactical

methods and skills; and never have there been systematic efforts to reconsider and reform teaching practices in the light of various new methods of communication or publication (printing press, copy-machines, radio or TV).

To the contrary, the most famous university reform proposals (by Wilhelm von Humboldt at the beginning of the 19th century) aimed at reinforcing the most archaic and non-technical forms of human interaction: informal verbal exchanges under face-to-face conditions. By emphasizing individual freedom and informal group processes, Humboldt was even enlarging the capacity of professors and students to cling to traditional practices: by denying that academic learning could be fruitfully subject to predictable planning, centralized administration and technocratic reforms.

Retrospectively, we may say that Humboldtianism was an early serious attempt to subvert formal institutional structures by strategies of decentralization and informalization. Evidently, such “devolutionary” reforms would not have been possible in the Middle Ages where almost all knowledge transmission was dependent on regularized lectures. But they were more viable after the invention of printing: because it could be maintained that the transmission of existing knowledge was now sufficiently secured through individual reading: so that social life within academic settings could be freed for less regularized (=more spontaneous and innovative) communications.

This traditionalism in teaching procedures is all the more astonishing when it is considered

- how intellectual and cultural life in general has been transformed by the printing press as well as many more recent innovations (radio, TV, cinema etc.).
- to what extent these same traditional forms of knowledge transmission have proven to be compatible with the innovative role of universities in enlarging and transforming scientific knowledge in all conceivable ways.

Evidently, there is much reason to believe that very elementary methods of face-to-face teaching may not only be compatible, but even highly functional for keeping pace with accelerating changes of knowledge, and for keeping teaching procedures highly integrated with ongoing processes of scientific research.

In fact, history provides many convincing examples for the general rule that very primitive, non-technological ways of human action can be the most fruitful seedbeds for cultural innovation. Thus, we all know how hand-working painters and sculptors have initiated the revolutions of modern arts, and to what degree major intellectual achievements of the enlightenment have originated in salons, coffeehouses or other settings of elementary informal social interaction.

In the case of universities, this paradox is standing out particularly because as a correlate of their scientific endeavors, they have propelled so many efficiency-enhancing technologies they themselves are unable to use because of their commitment to extremely low-tech labor-intensive procedures (Casper 1995).

Here, many “progressivists” would maintain that these alleged positive functions of academic conservatism have never been empirically verified, because universities function under the basic conditions that the successes or failures of their endeavors cannot be objectively measured.

In fact, like many other educational institutions, universities exemplify the paradox that school organizations are particularly inept to learn how to improve (or even optimize) the methods of learning, because they lack clarity of goals as well as feedback about the outcomes of various alternative ways of action. (Meyer/Rowan 1978; Geser 1990). In addition, it seems that growing societal complexity and accelerated socio-cultural change has the effect of shielding universities at least partially from pressures of reorganization. Thus, it is increasingly recognized that most knowledge needed in economic corporations cannot be learnt in the Academia, but has to be acquired in specifically

tailored courses of advanced training or more informal learning-on-the-job processes. This is especially true for the many spheres of “tacit knowledge” (essential for mastering almost any kind of vocational practice) will never be expected to be transmitted by intra-academic education.

There are good reasons for arguing that even the so-called “instrumental” disciplines which try to prepare for occupational practice find it increasingly difficult to design their teaching in a straightforward fashion, because modern occupational roles become so heterogeneous and variable that it becomes less and less evident what kind of vocational knowledge and skills academic studies shall produce. In law, for instance, it is well known that lawyers, judges and administrative legal advisors need highly divergent competencies: so that legal education does well to keep a certain equidistance to all these specific occupations by stressing more general aspects of jurisprudence (e. g. aspects related to legal theory and academic legal research).

As a consequence, universities tend to become more and more “self-referential”: by conferring degrees which are primarily useful for intra-academic advancement, because they are less and less acknowledged in the outside world:

“Graduation from high school gets you almost nowhere, a bachelor's degree will be followed by a master's degree that, in many instances, is only a stepping stone toward a doctorate that often entitles you to no more than becoming a postdoc - if you are that lucky. If we will indeed see a shift to life-long learning and a move toward what industry calls “just-in-time” training, then degrees may become increasingly meaningless.” (Casper 1995).

Finally, it has to be noted that consistent, directive technological change is unlikely to occur because universities are multipurpose-systems that combine highly divergent competitive goals. While some branches (like medicine or engineering) are under pressure to adapt to the instrumental needs of professional practice or specific occupational activities, others (like physics or astronomy) are predominantly guided by self-defined endeavors of fundamental research – contrasting again with the humanities where students are typically driven by highly intrinsic goals like: broadening their general education, widening their personal consciousness or deepening their familiarity with specific fields of culture.

At a time when masses of students flock into these latter culture-oriented and human-centered disciplines (while many technical fields evoke little interest), Edward Shils is certainly correct in emphasizing these “higher” functions of academic institutions which have always made them rather free from efficiency measurements and output controls: *“The universities cost immense sums of money, their achievements cannot be measured in any clear and reliable way, many persons fail in them, and they certainly do not accomplish the solution of economic and social problems which some expect of them. Nevertheless, these societies cling to them. The universities do not survive simply because professors have a vested interest in their survival. That would never be enough. These societies cling to them because, in the last analysis, they are their last best hope for a transfigured existence.”* (Shils 1992).

Given all these century-old conditions as well as these more recent developments, what justifies the expectation that contemporary university professors will accept the Internet as a new Mega-tool for their teaching, and that they will even actively participate in transforming their handwritten lecture notes and overhead transparencies into sophisticated digitalized learning materials and depersonalized online courses? And secondly: if academic teachers would be ready to embrace these new technologies: why should we expect that they would implement them in any systematic and “rational” way: e.g. with the explicit aim to make learning procedures less costly, more productive (or even: more widely accessible to students and population as whole)?

Certainly the lack of precise goal orientations, output measures and cost-revenue calculations may free universities to play with the new technologies in a much broader way than many other social institutions, because even highly dysfunctional applications become less easily manifest than for instance in hospitals or economic enterprises. But this same condition will have the effect that no consistent pressures exist to implement computer and Internet technologies in systematic ways for consensually agreed-upon specific purposes.

Instead, it is far more probable that for decades to come, universities will

- 1) remain fields of experimentation where different teachers, institutes and disciplines will diverge highly in the degree as well as in the precise way they make use of these new communicative tools;
- 2) largely continue to practice highly traditional forms of low-tech face-to-face teaching, because the superior functionality of the new media cannot be convincingly demonstrated, so that no consensual new model of virtual academic teaching can be agreed upon and implemented on an institutional scale.

3. The widening spectrum of alternative teaching and learning tools as a source of intra-academic heterogeneity, decentralization and informalization

Since several centuries, all advances in communication technology have had the effect of increasing the range of alternatives teachers and learners have at their hand: thus increasing the tension with the traditional academic setting which is still based on the lecture as the single preeminent mode of instruction.

The medieval origin of the lecture lies in the non-availability of book copies before the invention or printing: so that knowledge transmission was only possible by lecturing orally to many students within the physical reach of voice.

This condition was not basically changed until the end of the 18th century, because books remained rather expensive and scarce. Only in more recent times, the mass production of printed material – especially in pocket-book formats – has made academic literature easily available to all students, so that this basic objective reason for lectures was fading away.

In some cases, reading has become a substitute for attending lectures: especially in the field of law where all relevant knowledge is available in explicit written form. (Casper 1995). At other occasions, books are used in a subsidiary and complementary function: e. g. as textbooks used for preparing exams. In third cases, books have been used by dissident student for establishing an academic “counterculture”: e. g. in the late 60ies when many German students have formed autonomous lecturing-circles for studying Karl Marx, Herbert Marcuse or other “revolutionary” authors not adequately represented in the “bourgeois” university curriculum.

In fact, there is an uneasy coexistence between printed materials and oral lectures which can be called “anomic” because it is not defined by structured consensual rules. Thus, many more active students may find private reading more productive than attending lectures, because they have more autonomy in choosing time and place of their studies, in selecting adequate contents and in adapting learning procedures to their idiosyncratic preferences and skills.

In a similar vein, one of the most predictable (and already highly visible) impacts of digital media on universities is that they contribute to a rapidly growing diversity of learning practices and didactical forms: so that efforts to standardize and homogenize academic education are subverted on all levels.

While even primary school teachers have much usually discretion whether and how to use computers in their classrooms (Bennett 1996), university teachers continue to enjoy a legally based freedom to choose their own teaching methods and didactical tools. Thus, we are not astonished to see growing divergences between computer-savvy teachers who make sophisticated use of the new technologies, and conservative teachers who cling to their conventional habits because of technological skepticism or mere lack of time and motivation. In particular, dramatic gaps may break up between teachers (or whole institutes or disciplines) who use the new media for revolutionizing their methods of teaching and research, and those who instrumentalize them for cementing traditional methods and structures (e. g. by distributing their traditional top-down mass-audience lecture in video format, without adding features of interactivity and inter-student cooperation (Maddux, Johnson, and Willis, 1997; Bracewell et. al 1998). Similarly, we may well see increasing divergences between locally-minded and cosmopolitan scientists, between more teaching-oriented and more research-oriented professors, or between densely-knit and loosely knit networks of intradisciplinary cooperation.

As long as academic teachers enjoy the freedom to choose their own technological forms of presentation and communication, they will continue to design their courses in an unsystematic handicraft fashion: so that digital components will certainly be used, but in unpredictable and idiosyncratic ways. By enriching the toolkit teachers have available for presenting materials and organizing their courses, online media will inevitably contribute to growing divergences of teaching formats and teaching outcomes (between individual teachers as well as between enrollment cohorts, institutions, academic institutions and whole national university systems):

“Academics generally construct courses in a somewhat haphazard way from prepared lectures, handouts, photocopies of book chapters, reading lists, journal articles, laboratory notes, case studies, and so on. Hence, the vision of a degree course that is completely virtual--high tech, fully integrated, stand alone, based entirely on computer applications, and difficult to upgrade--is unlikely to become the model for the typical course of the future. Rather, computer assisted learning products are most likely to be used by academics if they are easily customized, capable of being modified, upgraded, and integrated with traditional teaching material, and discarded as soon as their useful life is past.” (Greenhalgh 2001).

For individual teachers, there is an inevitable downside of these enlarged freedoms and choices: the increasing pressure to expose themselves publicly in unprecedented ways. This exposure stems from the fact that all usages (or non-usages) they make of these new media are inevitably attributed to them as results of their personal decision: and thus as an expression of their individual character, values and preferences, or as correlates of their (outstanding, modest or awfully inadequate) individual talents and skills.

For instance, professors may be judged to be highly conservative and “closed up” when they maintain only minimal websites devoid of any personal information, while they may be considered “progressive” and “open-minded” when they publish their whole bibliography or all the enterprises and institutions funding their research. Likewise, elaborate information about teaching activities may be seen as an indicator of

high “student-orientation”, while detailed enumeration of awards and prices may convey an impression of status-mindedness and egocentrism.¹

Similarly, the decision to use email entails an increase in personal expressiveness, insofar as in comparison to the highly ritualized mail letters, there are far more options to respond quickly or with delay, to be short or explicit, to engage in formal or colloquial style, to add links or documents, or to send the same message to additional recipients.

In short: the new media are highly potent catalyzers of individualization and personalization. Consequently, they are highly threatening to individuals who don't like to be stripped of their depersonalized formal status (e. g. incumbents of high-ranking positions), or which are obliged to act in depersonalized ways under the strict guidance of formal rules (e. g. policemen or low-level bureaucrats).

As members of an elitist profession, university professors have always felt the need to preserve their high collective status position by shielding themselves from highly individualized informal interaction. Historically, this has been achieved by social distance, by maintaining highly formalized and ritualized (and therefore: depersonalizing) practices, or even by wearing uniform garments (“Talare” or “Ornate” in Germany). While such shielding devices have decayed since several decades (especially since the New Left revolt in the late sixties), the Internet certainly adds to the “vulnerability” of university professors by forcing them to expose themselves in a highly personalized manner – without providing the shelter of new de-individualizing norms and traditions.

Given the multitude of options to dispense knowledge and to structure learning processes, many more studies are needed to assess the specific functionalities of various methods, and teachers as well as course designing institutions have to give much more thought to the question which methods are optimally suited for transmitting what kind of knowledge and for achieving what kind of educational results:

“Just as no single traditional method is appropriate to all teaching-learning tasks, no technological tool is either. Computer simulation is appropriate especially for teaching-learning tasks requiring large numbers of variables that interact in complex ways and that can be mastered only by experiential methods. A self-directed hypertext model may work well for exploratory learning but is less than adequate for content requiring precision, attention to detail, and broad command of factual knowledge.” (Stahlke/Nyce 1996).

Consequently, “virtual campuses” are typically not centrally designed and implemented by technocratic top-down implementation. Instead, they grow from the bottom as a manifold of small projects specifically designed for specific disciplines or particular courses.

“Summarising, we can conclude that the implementation of ICT cannot be realised by blueprints. Schools and teachers should learn and should be able to design their own educational situation, possibly choosing from the varied potential ICT has to offer.” (Jager/Lokman 1999).

In fact, there are limitless possibilities for combining various digital applications with each other as well as with more conventional offline procedures. While a first teacher may be eager to substitute his mass audience lectures by highly professional online

¹ Thus, we should not be without empathy for teachers who decide not to maintain any personal website at all, because they prefer to be judged as “technologically behind” than to face the unintentional negative attributions a suboptimal Web-Presentation may easily evoke.

courses, a second will make use of the Net for facilitating multilateral discussion among his students; a third will specialize on tutoring services “on demand” by bilateral email contacts with individual learners; a fourth will cultivate internetted learning communities across different universities and countries; and a fifth may encourage students to the Net as a research tool (e. g. for conducting surveys or ethnographic studies).

In short: the main causal impact of the new media seems to amplify existing and to create additional divergences on all organizational levels: because they provide support for the expression of any individual values and preferences and any kind of social habits and norms.

“Let a hundred flowers flourish” – this Maoist strategy is of course only viable in settings where traditional academic freedom is highly respected, and where the involvement of teachers in highly structured curricula is rather low.

While we may well see the most advanced and the most fruitful applications in such freer settings, a high price is paid in terms of increasing diversity, fluctuation and individualization of learning practices and learning outcomes: so that the possibilities to achieve predictable qualification levels and to standardize educational outcomes over time and places will shrink rather than increase.

4. Upward and downward digitalization: two contradictory uses of online media for academic learning

From the analytical perspective of sociological theory, it seems fruitful to classify the many uses of computer and online media according to the degree they increase or decrease the discretion and power of various social actors.

On the one hand, there are strategies of **“upward digitalization”** which promote the centralization of power on the level of societal elites, large organizations and institutions, and which diminish the autonomy of smaller collectivities and individuals by increasing the scope and intensifying the implementation of generalized technological standards and social norms. In academic settings, such tendencies are seen in widespread endeavors of “educational commodification”: by bringing learning materials, courses and whole curricula in standardized digitalized formats, so that they can be separated from their originators, and copied, sold and implemented worldwide in identical form.

On the other hand, there are countervailing modes of **“downward digitalization”** which have the effect of empowering smaller groups and individual teachers and students: by increasing their autonomy in selecting among a wide variety of information sources, didactic tools and learning procedures, and in substituting highly authoritative and formalized top-down procedures by horizontal learning processes based on decentralized and informalized mutual communication.

4.1 Strategies of “upward digitalization”: empowering organizations, formal institutions and centralized educational elites

In the more consolidated scientific fields based on stable, consensual and highly specified paradigmatic premises, theoretical concepts, terminologies and methodological approaches, optimal conditions exist for codifying and systematizing knowledge to a

degree that it can be fully incorporated in digitalized formats like online courses, automatic self-learning programs or encyclopedic media like CD-ROMS.

In such fields, all knowledge transmitted (or newly created) will be readily understood in identical ways by anybody who is familiar with these fundamental premises and terminological conventions, without any need for further contextualizations. In fact, highly abbreviated “restricted codes” (e. g. based on mathematical formalisms) can be used without losing any relevant information, so that storage and transmission processes can be reliable and efficient even when media with rather low bandwidth are used.

Evidently, these conditions are at least partially given in most natural science disciplines (like physics, chemistry or microbiology) which have organized at least their conventional, undisputed realms of knowledge in terms highly consolidated and globally accepted terminologies, data measurement methods, analytic formalisms and paradigmatic structures.

For such solidified stocks of academic knowledge, digitalization may follow primarily the course of “commodification”, by *“transforming courses into courseware, the activity of instruction itself into commercially viable proprietary products that can be owned and bought and sold in the market.”* (Noble 1998)

Thus, education will become the basis of a “knowledge-based industry” which may finally degrade universities to recipients and operative agents of digitalized study programs developed and marketed by very potent commercial firms.

When such strategies are pursued, the time may soon end when every teacher designs his own courses *ab ovo*, because online courses are available which transmit the same knowledge in far more professional ways (Schank/Jona 2000).

“The bottom line is that traditional academic courses are no longer going to be taught by local teachers. The computer will allow the designers of these courses to be the best and the brightest in any given field. Moreover, these courses will be very engaging, non-threatening, diverse, and fun. Once the very best physicists in the world sit down and create a physics course, there will be little use for local physics teachers.” (Schank/Jona 2000).

Online courses have also the big advantage that they can be updated very quickly, so that the training of potentially millions of users all over the globe can be kept in pace with rapidly developing scientific research (Barlow 2000).

Under ideal conditions, it would pay out to spend 10 Mio Dollars to realize a single course in introductory statistics by employing the best didactic experts and by making use of the most sophisticated multimedia technologies, because the same course then could be applied identically all over the world.

“Developing quality multimedia courseware is too difficult for 98% of all faculty. Watch the end of a movie next time and notice that to produce 120 minutes of interesting material it required 100 different people at a cost of, say, \$15 million. A typical higher education semester comprises over 2, 000 minutes of material. Reasonably, a meaningful amount of multimedia content might cover 10% of the course. That comes to 200 minutes -- much more time than a multi-million dollar movie.” (Solomon 1994).

In addition, digitalized materials have to be updated regularly in order to keep them in pace with current research – costs which can also be tremendous when sophisticated multimedia presentations have to be revised (Brahler/Peterson/Johnson 1999)

Given these horrendous amounts of initial fixed costs, it is plausible to assume that the introductory courses of well-frequented disciplines (like medicine and law) will be the first to be subject to these new developments, because

- they can be applied identically in many different institutions and cultural settings;
- costs of updating are relatively limited, because basic knowledge is often rather stable over time.

These of course excellent preconditions for even very high investments to pay out (Schank / Jona 2000),

For the same reasons, it is to be expected that increasing economic pressures will come up to distribute the products to a maximum number of recipients, thus weakening or even abolishing traditional access conditions defined by the educational institution itself (like Gymnasium certificates, bachelor degrees etc).

“Andrew Rosenfield, for example, is the chief executive of Unext.com, a startup that plans to offer a full range of college courses over the Internet. Rosenfield estimates his company will spend nearly \$100 million developing courses before it receives \$1 of tuition. Unext envisions a world where anyone can begin a course in, say, basic finance, at any time of the year, from any location.” (Steinberg(Wyatt 2000).

Apart from material resources and organizational capacities, the traditional reputation of a university will be a decisive factor for success in this new global market. Thus, prestigious institutions like Harvard, MIT, Stanford, Oxford and Cambridge will certainly utilize their high standing for establishing themselves as top worldwide brands, because most other universities will be eager to import some of this reputation at least in the watered-down form of standardized online courses. Of course, this will make such institutions highly attractive for economic investors: so that we may well see the widening of AOL -Time Warner (or similar corporations) to a more ambitious “knowledge conglomerate” by joint ventures with some top shot academic institutions (Schank/Jona 2000, Barlow 2000).

In a global perspective, the turn toward virtual education will almost certainly increase the dominance of American academic culture: because the combination of high-standing American universities with the efficiency of Academic Business will create a potential almost no other countries will be able to resist.

On the other hand, most second and third-ranking universities will come under pressure: like many handicraft factories of the early industrialization age which were wiped out because of their inability to provide the necessary capital investments and technical expertise:

“Many of the mid- and lower-tier institutions will be the hardest hit because they have few superstars and there is little to differentiate their curricula. Economics 101 is likely to be the same at most community colleges. There is no reason to believe that 500 versions of the same course could be sustained in a global market. A more likely scenario is that a single course-say, the software version of Columbia's Economics 101-will become the industry standard, and students who once might have attended the local state school branch or its online equivalent will instead flock to Columbia's online course, with obvious results for other programs.” (Green 2000).

In comparison to this high level of professionalization, local teachers would feel degraded in the same way local filmmakers feel small in relation to Hollywood producers: except in the rare cases when they are called to participate in the new virtual programs, because

“There will be a tremendous amount of prestige associated with being asked to help shape the physics course that all the students in the country will take.” (Schank/Jona 2000).

In analogy to the processes of industrial proletarianization described (and denounced) by Karl Marx more than 150 years ago, this development may have the effect of disowning, deskilling and degrading the teachers by transforming their professional knowledge into depersonalized “intellectual capital” which can be fully controlled (and developed further) by economic corporations:

“With the commodification of instruction, teachers as labor are drawn into a production process designed for the efficient creation of instructional commodities, and hence become subject to all the pressures that have befallen production workers in other industries undergoing rapid technological transformation from above.

In this context faculty have much more in common with the historic plight of other skilled workers than they care to acknowledge. Like these others, their activity is being restructured, via the technology, in order to reduce their autonomy, independence, and control over their work and to place workplace knowledge and control as much as possible into the hands of the administration. As in other industries, the technology is being deployed by management primarily to discipline, de-skill, and displace labor.” (Noble 1998).

Given the high economic stakes associated with this new educational industry, it is evident that universities engaged in these endeavors are interested to disown the professors by attacking their copyright on course materials and by delegating the production of online courses to subaltern academic personnel which can easily be replaced (Green 2000).

This is vividly illustrated by the online branch of the University of Maryland University College (UMUC) which relies primarily on part-time adjuncts and teaching associates, not on full-time professors:

“Although UMUC is the largest online school in the country, only about 20 percent of its faculty are full time. Even full-timers produce - but do not own - the school's hundreds of online courses. No single faculty member designs a course, nor do those who design courses necessarily teach them. Instead, that duty generally falls to adjuncts, who are largely interchangeable. This system gives UMUC maximum power and copyright control over intellectual property. ‘We wouldn’t do it any other way,’ says UMUC’s President Gerald Heeger. ‘We don’t want to lose the course if a professor isn’t available to teach it or moves on to another university.’” (Green 2000).

A major motive for working with relatively low-ranking academicians stems from the fact that they are less resistant than professors to enter into cooperative relations with knowledge engineers, didactics experts, software technicians and all the other specialists necessary for producing sophisticated components of online learning.

“The development of computer based teaching and learning materials requires expertise in content, in pedagogy, and in technical aspects of design and delivery. Staff with most to offer in the way of technical design may overlook important educational principles, and those who focus on content may make incorrect assumptions about the ability of the technology to deliver their imaginative ideas. A multidisciplinary, team based approach is likely to be the most successful model for working.” (Greenhalgh 2001).

Within universities, the power may shift from the faculty to the administrators who are eager to sell the commodified academic products of their institution profitably to these new Educational maintenance organizations”:

“The third major promoters of this transformation are the university administrators, who see it as a way of giving their institutions a fashionably forward-looking image. More importantly, they view computer-based instruction as a means of reducing their direct labor and plant maintenance costs - fewer teachers and classrooms - while at the same time undermining the autonomy and independence of faculty. At the same time, they are hoping to get a piece of the commercial action for their institutions or themselves, as vendors in their own right of software and content.” (Noble 1998).

Certainly, there will always some teachers who will readily participate in this “collective suicide action” because they draw high personal profits from their collaboration with digitalizing corporations.

On the other hand, however, the analogy with industrial rationalization is far from complete, because it has never been proven that digitalized courses have considerable labor-saving effects. To the contrary, university teachers which apply online courses see that the reduction in direct teaching activities is more than compensated by the increase of various auxiliary tasks:

“At the same time, the use of the technology entails an inevitable extension of working time and an intensification of work as faculty struggle at all hours of the day and night to stay on top of the technology and respond, via chat rooms, virtual office hours, and e-mail, to both students and administrators to whom they have now become instantly and continuously accessible.” (Noble 1998).

Like in many other economic branches, we will see that such standardized commodified educational products will be consumed primarily by poorer clients (e. g. lower-class students and universities in rural regions and underdeveloped countries), while richer countries and higher-class students will cling much longer to the preindustrial traditions of personalized “handicraft education” based on exclusive membership and expensive stays at prestigious academic institutions (Noble 1998).

While such perspectives of educational industrialization and centralization seem disquieting, there are nevertheless good reasons to assume that they will remain restricted to rather few disciplines (or to smaller segregated “islands” of consolidated knowledge within some disciplines), because in most academic fields, the epistemological and methodological preconditions for these processes are not fulfilled.

All endeavors of upward digitalization rely on the premise that knowledge is available as a product of already completed processes of research and interpretation: as a pool of objective truths which can be dissociated from social communications and incorporated in online courses because their validity is independent any the characteristics, values and interpretation frames of specific observers, and not affected by any particular situational conditions.

Inspecting the full range of academic disciplines, it is evident that *mathematics and logics* stand out as fields where knowledge is approaching this perfectly decontextualized form. Similar conditions hold in the *natural and technical sciences* (e. g. classical physics or chemistry) to the degree that they are based on formalized terminologies and algorithms which have no reference to particular empirical cases or circumstances.

On the other hand, such decontextualization is impossible whenever scientific knowledge has to be applied to particular problem cases which emerge exogenously (not as artificial problems created within science itself).

In the field of *clinical medicine*, for instance, knowledge transmitted by online channels will always offer a very incomplete guidance for learning how to diagnose concrete illnesses and how to treat given individuals, because such judgments can only be made by taking into account a wide variety of information specific for each particular patient (about his personality, behavioral habits, family history, life circumstances etc.). Many of these cues can only be gained in “seeing the patient” face to face – what readily explains why medical schools make low use of distance learning arrangements (Hamza/Alhalabi 1999).

Strong needs for contextualizing knowledge are also characteristic for the humanities and many social sciences, where no institutionalized common premises, concepts and perspectives have ever been developed, because outlooks, definitions and approaches vary between individual authors, or because multiple, mutually inconsistent paradigmata, theories (or even epistemological outlooks) coexist.

In sociology, for instance, propositions containing words like “power”, “decentralization”, “democracy”, “interaction”, “society” or “social movements” have no precise intrinsic meaning, because no single authoritative definition of such terms has ever been achieved.

As a consequence, communication about such propositions can only be effective when a highly “elaborated code” is used in order to clarify their specific meaning in the light of the concrete setting within which they are currently used.

In organizational sociology, for instance, a proposition like “decentralization and productivity are positively related” is only meaningful when it goes along with the information that

- decentralization has been operationalized as the amount of money which can be spent by lower managers without asking their supervisors;
- productivity has been measured as the average number of cars repaired, divided by the total number of employees;
- the study refers exclusively to smaller repair shops in Ohio during 1985 and 1995.

In order to assess the validity and relevance of such findings, much (potentially controversial) discussion is needed about their generalizability to other settings or alternative modes of empirical operationalization.

Evidently, such “contingent knowledge” doesn’t lend itself easily to any definitive codification and any incorporation in technical media, because too much qualifying side-information would have to be added, which cannot be all specified in advance, and too many definitions and explanations have to be provided within each particular setting of application, because it cannot be supposed that any recipients share them in advance.

Consequently, it often seems more adequate to transmit such knowledge within traditional class teaching courses, because participants of specific courses are embedded in the same school setting and have received identical previous training, and because they know their professor (and his publications) well enough to decipher “what he really means”.

The teacher himself will feel more at ease to make even highly speculative assertions because he/she has always the option to question their validity by using nonverbal or verbal cues to demonstrate “role distance”, by showing compliance to student criticism, or by adding self-qualifying comments.

On the other hand, the question arises to what extent digital online technologies can also be instrumentalized for facilitating such processes of knowledge specification, interpretation and contextualization. In fact, there are good reasons to argue that when they are used to empower individuals and informal groupings (instead of formal organi-

zations and institutions), they may easily substitute or even outperform traditional face-to-face settings in exactly these subtle and volatile processes of academic learning and innovation.

4.2 Strategies of downward digitalization: empowering individuals and informal groupings

Nobody will deny that young children usually learn with extreme effectiveness without any authoritative guidance: e.g. by simply watching environmental conditions and developments, by self-guided trial and error processes and by accidental, spontaneous copying of what older siblings or grown ups spell out or do.

Paradoxically, all conventional schooling is built on the premise that despite their unquestionable higher mental and physical maturity, older children are less prone to continue learning in such spontaneous, autonomous fashion, so that effective education has to be based on the passive reception of authoritatively transmitted knowledge within contexts of high formality, standardization and hierarchical formal control.

While developmental psychology has never demonstrated why such a complete reversal in learning procedures is justified between early and later childhood, any school teacher knows how much formal schooling methods are apt to demotivate children, and what dramatic discrepancies exist between the highly standardized, homogeneous learning conditions (within classes) on the one hand and the extremely divergent learning results (between class participants) on the other.

Despite research results which show that students are more motivated and successful when they have control over the learning processes ((Bovy, 1981; Fisher/Grant 1983)., the formality of conventional schooling could be easily legitimated by the economic need to allocated many pupils to a single teacher: arguments which have to be thoroughly reconsidered with the advent of computer-supported learning devices.

Phenomenologist philosophers like Edmund Husserl have stressed that the basic condition of any human perception and knowledge is its embedment in a setting of associations and connotations (“Verweisungshorizonte”), in the sense that everything seen, heard or read draws its meaning not from its intrinsic isolated properties, but from its relationships to other such experiences – which are all finally understood by being embedded in a single encompassing World we all share.

Thus, the word “Goethe” is meaningful to the degree that it evokes a rich set of associations which may refer to the 18th century, to Germany as a country or Weimar as a city, to alternative writers like Lessing or Schiller etc etc.

Similarly, the additional knowledge I can derive from a factual information like “*lumber firms are destroying rain forests in Indonesia*” depends very much on what I know about the compositions and functions of rain forests, about the physical, societal and cultural features of Indonesia, about the conditions of the global wood industry and about the current conditions of transnational economic relations.

Consequently, knowledge transmission cannot be understood as the dispensing of a certain quantity of isolated pieces of information, but as a process directed to enlarge such sets of meaningful associations.

For instance, studying law means: to increase the understanding of basic notions like “property”, “person” or “contract” by embedding them in an ever richer context of meaningful connotations.

Talking about the connectivity of all knowledge helps to grasp the difference between knowledge and mere information. The *information content* of the sentence “Switzerland

has 7 Mio inhabitants” can be said to be the meaning which is *intrinsic* to the sentence itself: so that it remains the same at all times and places this sentence is spelled out. The *knowledge content* of this same sentence, however, is extremely variable, because it is constituted *extrinsically* by all connotations it evokes in a given recipient. A historian, for instance, will learn from it that the Swiss population has risen by 3 Mio within 40 years, while an economist will be impressed by the fact that relative to its demographic base, the position of Switzerland in global financial markets is rather high.-

If this is acknowledged, it has to be concluded that effective knowledge creation and knowledge transmission depends not primarily on the amount of information generated or transferred, but on the capacity to enrich the knowledge content of given information pieces by integrating them in a denser network of interrelations, connotations and associations.

By using this measure rod, it becomes evident that all the traditional institutions and technologies explicitly dedicated to knowledge transmission fall short in many important ways, because their physical and structural properties cause them to fragment interconnected knowledge into rather segregated packages: so that it becomes artificially “decontextualized” and often reduced to its basic informational contents.

In other words: the main handicap of all traditional communication technologies is their tendency to create segregated parcels of knowledge isolated from the roots of its origin (and thus highly degraded to mere “information”): packages segmented in a way to fit into specific books, journals or audio or video tapes of a specific length.

Recipients of this kind of knowledge have no opportunity to ascertain the wider context within which it has been created and tested – and this for two reasons:

1) Physical segmentation of media products

Spending money for buying a specific book or subscribing to a specific journal diminishes my resources for gaining access to alternative – equally expensive – text resources, and when I’m reading it, I face a physical entity which is hermetically closed in the sense that I can only move within the given texts, while movements to other documents (even if highly recommended in the bibliographies) - as well as communications with other readers - are not facilitated in any way.

Thus, to read a specific book is something similar as entering a cave with only one entrance and with place for only one visitor at a time. I can easily look and move around, inspect the wall paintings from various distance and fix my thoughts and observations in tiny written notes, but when time goes on, I will feel a growing need to go out in order to talk with somebody about what I have seen, or in order to widen my experiences by visit other interesting locations.

Similar disjunctive conditions hold on the organizational level. For instance, it is inevitable that choosing to enroll in university A and branch X will preclude at least simultaneous enrollment in university B or branch Y. This is so because of physical reasons of space and time as well as because of organizational structures and legal rules (which are both often anchored in such physical/territorial segmentations and tend to amplify their divisive effects by norms of exclusive membership and other prescriptive and prohibitive formal restrictions).

Given the fundamental similarity of traditional organizations and conventional media to segregate knowledge, it is not astonishing that these two levels have frequently been combined for purposes of mutual reinforcement. For instance, textbooks have the function of constituting the segregated knowledge base on which university courses (especially on introductory levels) can easily been built; and on the other hand, the con-

tent of lecture courses can easily be compiled and condensed into scripts which contain all the “knowledge” (or at least: all the information) needed to pass a particular examination.

Thus, the whole conventional school system is based on “spaces of enclosure” (Lankshear et. al. 1996) which have to function of segregating out self-contained islands of knowledge and meaning:

“The learner’s task is then one of extracting a singular canonical meaning and the teacher’s that of being the ‘authority’ in terms of interpretation and accuracy.” (Usher/Edwards 1998).

These prevalent tendencies for knowledge segmentation cannot be fully explained by the intrinsic properties of organizations and media. Instead, they are strongly maintained by the psychological needs of the teachers for “knowing exactly what has (and has not) to be taught”, and the equally strong motivation of students to “know precisely what has (and has not) to be learnt”.

2) Lack of interactivity:

Reading as book isolates me from contexts of social interaction, and it offers me no facilities to get into contact with the publishing institutions or with the individual authors. When authoring an introductory textbook of any sort, for instance, I’m forced to bring knowledge into a self-sufficient, intrinsically decodable form: so that its meaning is perfectly clear even to junior students who have no background in the field and who don’t use any alternative sources. Consequently, I will do well to focus exclusively on well-established, “canonized” knowledge which is consensually accepted in the scientific community and which is so elaborated that no reasonable grounds for questioning it exists. Instead, to deal with controversial issues (e. g. currently unsolved research topics or competing theoretical perspectives) means: to risk questionable or erroneous statements which cannot be corrected by changing the printed manuscript or by communicating revising commentaries to my readers. Evidently, books are most adequate to transport knowledge which will never be changed because of traditional authority (bible) or because of its unquestioned correctness on a logical or mathematical level (Euclidian geometry); but least adequate in all fields where knowledge is fluid and incoherent because innovative research is currently proceeding (e. g. because many contradictory theories are competing (cosmology) or because the research objects is rapidly changing (sociology)).

In other words: printed texts have always been an inadequate media for modern science which since its origin in the 16th century) defines human knowledge as something fragmentary and submitted to constant revisions and change.

Evidently, conventional educational institutions as a whole have never sufficiently supported the fluid cognitive processes of the curious human mind: its never-ending drive to transcend current states of knowledge by jumping to subsequent perceptions, ideas and imaginations. While this behavior is certainly supported by psychological motivations, it is primarily guided by the structure of self-transcending character of knowledge itself: by the intrinsic capacity of every concept to evoke many other concepts (e. g. by rules associative similarity or logical implication), and by the capacity of every information to represent an object or event on which many additional information can potentially be gathered. Thus, institutional education was always separated by a large gap from all these informal and “spontaneous” knowledge-generating processes by which younger children acquire their basic cognitions and (e. g. linguistic) skills, and which are later permanently going on in (extrainstitutional) everyday life.

Only when these constraining conditions of all traditional teaching and learning are fully considered, the immense innovative potential of the new digital media in general and of the Internet in particular can be fully spelled out and appreciated.

On the most general level, it may be said that by adopting the new digital media, educational institutions gain the fundamental capacity of *switching from segregative to connective knowledge-transmission procedures*: so that they can be smoothly adapted to the associative roaming of subjective human mental activities on the one hand, and to the densely-knit connectivity of objective knowledge-structures on the other.

While reading a book may be compared to entering a single-entrance cave for purposes of contemplation, surfing on the Internet means: visiting a central market place for purposes of expansion and distraction: the location where the central information office of the city is situated, where I can meet all sorts of other roamers for exchanging news and discussion various topics day and night, where a multitude of vendors offer all imaginable sorts of products and services, and from which many streets lead away in all possible directions.

As a consequence, all knowledge transmitted in teaching procedures can assume a status of relativity and reversibility because it situates itself in an environment of alternative communication

Thus, I can easily publish online texts that don't pretend to convey well established canonized knowledge in a finalized authoritative form, because I can relativize its status from the onset

- a) by linking it to other online texts which may expound very different (even contradictory views)
- b) by inviting readers to inform themselves about more specific contextual details and/or to send comments and corrections
- c) by remaining committed to revise and/or enlarge the text whenever my own learning has advanced and my judgments have considerably changed.

In short, publishing online offers the opportunity to make use of all advantages of written communication without the negative freezing and decontextualization effects which inevitably go along with conventional printed publications.

More than that: learning processes can dissociate themselves completely from authoritative textbook guidance: giving way to self-guided processes of exploration, discovery, selection and synthesization: similar to the unprogrammed and unpredictable ways of preschool learning.

“The design strategies which maximize the learning potential of open-ended environments put the locus of control on the learner's side, thus enabling the learner to engage much more in the construction of content. This in turn makes student learning strategies much more significant in the classroom. Students who not only are made aware of, but who take control of, those technologies must be able to plan, choose, inquire into topics, solve problems, monitor their progression, and evaluate results.” (Bracewell 1998).

The emancipative effect of the new media on human learning activities is best understood when their highly different impact on the three aggregation levels of cognitive patterns - “data”, “information” and “knowledge” – is considered.

In a rather simplified fashion, it can be generalized that Computers and Computer networks are most apt to increase the volume of available *data*: thus leaving it to human actors to aggregate them to meaningful information.

In fact, the more different *data* are available, the more human effort has to be invested in selecting and synthesizing them in order to create meaningful *information* (e. g. by aggregating yearly population figures in order to demonstrate demographic changes). Similarly, the more such information is available, the more human intellectual activity is needed to synthesize and contextualize it in order to create real *knowledge*: e. g. by interpreting long-term temperature changes in terms of theories of climatic change).

In the past, data and information were so scarce that they have been tightly bound to knowledge (e. g. temperature and humidity data were only gathered when they were necessitated for weather forecasts, and correlation coefficients were only calculated when they were judged be relevant for testing specific hypothesis).

With the rise of computers and the Internet, data sources have multiplied and information is so abundant that most of it is “free-floating” in the sense that is not integrated in any cognitive conceptual schemes, and even less related to any scientific theory or proposition.

While the transformation of data into information can be considerably automatized by means of statistical procedures, table-generating programs or other synthesizing software devices, the synthesis of information into real knowledge remains largely a task for human beings. More and more, exactly this capacity is becoming the most important skill of effective learning and fruitful research.

Thus, students who use the Internet for learning face inevitably the task of selecting and evaluating and synthesizing highly discrepant information sources under the perspective of their contribution to the knowledge they are looking for : e. g. when they collect international data on criminality in order to compare countries according to the differential prevalence of various forms of delinquent behavior.

Consequently, the positive effects of online media on learning do not stem from any intrinsic properties of digital information, but from the capacity of online learners to use it as raw material for constructing meaningful knowledge.

“Information technology has led to an alarming expectation that it may be possible to educate students by simply linking them up to the Web. Give them access to information. The notion is often accompanied by the rhetoric of being student-oriented, learner-centred, it even shades into consumer choice on occasion. The student as consumer in the free market of ideas. But information is to knowledge as bricks are to buildings. It is as absurd to try and solve the problems of education by giving people access to information as it would be to solve the housing problem by giving people access to bricks. Part of the point of an education is to give people the skills and understanding to enable them to handle information. Before having unlimited access to it you have to know what to do with it, how to select, how to evaluate and critique it, how to recognise what's missing, how to generate what you need. It's no that the Internet is irrelevant to our students, it's a useful source of information, but that's all.” (Laurillard 1995).

In other words: the Internet has the effect of loosening the causal impact of media content on learning outcomes, while strengthening the degree to which learning results are dependent on characteristics of the students: e. g. on their motivations and capacities acquire specific knowledge and skills:

“So we must not begin with what the new technology offers. Examining instead what students need, we are led to a quite different analysis of how new technology can help. Most importantly, it should (a) give students more opportunities to engage with the

practice of their subject; and (b) give them more opportunities to discuss and articulate their ideas.” (Laurillard 1995).

As a consequence, the virtual classroom assumes characteristics of a “creative chaos” (Nomaka 1994), so that procedures as well as outcomes of teaching processes can no longer be preprogrammed and predicted. This again will preclude almost any possibilities of commercialization, because few students would be ready to pay considerable fees without getting any guarantee what exactly they will learn within which period of time.

Given the abundance of information sites and communication networks in the Internet, every a mediocre student can easily become a kind of “expert” from whom teachers and colleagues can profit : e. g. by collecting and synthesizing data or by exploring knowledge sources no one else has hitherto exploited (Usher/Edwards 1998). Thus, the sharp vertical divisions between knowledgeable teachers and ignorant students may be replaced by more horizontal role specializations based on current fields of interest and activity. As a consequence, the whole style of classroom communication is significantly changed, because

“the digital medium...encourages a branching discussion in which students link up to a network...the pedagogical dynamic is more provisional, not question-answer but comment-elaboration with cues coming from a number of centres besides that of the teacher” (Tabbi 1997: 239).

The “Neohumboldtian” features of the virtual campus are most clearly seen in the growing capacity of students to structure their own learning procedures, so that they can adapt pace and direction of courses to their own preferences and skills.

“Cyberspace creates a reader-controlled environment or at least an environment where the distinction or boundary between readers and writers becomes less clear and consequently textual production and interpretation become less bounded. Hence, learners are more able to determine their own paths of learning where they do not simply interpret pre-given meanings but actively collaborate in its creation. In cyberspace practices, meanings are more readily negotiated by its users.” (Usher/Edwards 1998).

A major handicap of traditional classroom situations is that most questions coming up during a lecture will never surface because they cannot be articulated in the very moment they arise. This problem can be solved by means of *key response pads* or other facilities which allow students to feed in questions anonymously during a course: so that they appear on a screen and can be immediately handled by the teacher (Briggs et. al 1992; Leidner/Jarvenpaa 1995).

As experiments with computerized seminars at the university of Aberdeen have shown, the anonymity provided by online courses encourage a larger percentage of students to participate actively in discussions (Newlands/Ward 2000).

In addition, it could be shown that virtual discussions generally lead to more horizontal exchanges between students. In the traditional classroom, vertical interactions (between teacher and individual students) prevail, because teachers within a classroom occupy a highly visible position in front of their students, so that they constantly attract their attention and are therefore easily able to dominate the discourse. Online teachers however find themselves no longer privileged and elevated by such physical arrangements, so that they have to accept a more equal status as their students who possess exactly the same technical means of expression.

Of course, they may still be able to exert more influence on the discussion, but this influence then will have to be based on other factors than mere physical visibility: e. g. on

the fact that they possess a high reputation, or because they provide outstanding intellectual contributions.

"Software of electronic communication is blind with respect to the vertical hierarchy in social relationships and organizations. Once people have electric access, their status, power and prestige are communicated neither contextually (the way secretaries and meeting rooms and clothes communicate) nor dynamically (the way gaze, touch, and facial and paralinguistic behavior communicate). Thus charismatic and high status people may have less influence, and group members may participate more equally in computer communication." (Kiesler/Siegel/McGuire 1988: 662).

The eroding influence of online media on teacher authority is also illustrated by the well known capacity of email messaging to draw higher-level status incumbents into more intensive and more informalized bottom-up communications.

Upward communication between students and professors has hitherto been handicapped by the simple fact that the latter are often hard to reach (as well in their offices or by phone), and that students often find it too intrusive to stop an academic teacher on the gangway or by bothering him with a (potentially quite untimely) call. Sending mailed letters is often also considered to be unfitting because of the effort and time needed for a response (except in very serious and not too urgent matters).

Email is known to have a special functionality for bottom-up communication: because it provides subordinates with a channel for contacting their superiors in a far less intrusive fashion than by phone calls: by leaving the recipients free to read and answer the messages at their preferred time (Sproull/Kiesler 1986).

Adding the anonymity of the interaction, it is easy to explain why Email is used even by students who feel a very high social distance to their professors (e. g. beginners), or students who are too shy and insecure to express their demands or opinions within their class (Bold 1997).

In contrast to the rather formal interaction patterns characteristic for scheduled audiences (usually in the professor's office), Email gives rise to a more informal communication style permeated by colloquial elements and only poorly guided by conventional rules:

"...people using electronic mail overstep conventional time boundaries dividing office and home, they mix work and personal communications, they use language appropriate for boardrooms and ballfields interchangeably; and they disregard normal conventions of privacy (for instance, by posting personal messages to general bulletin boards). This behavior is not counteracted by established conventions or etiquette for computer communication. There are few shared standards for salutations, for structuring formal vs. informal messages, or for adapting content to achieve both impact and politeness." (Kiesler/Siegel/McGuire 1988: 662/663).

Nevertheless, professors are often quite disposed to maintain widespread bilateral (and also multilateral) relationships with students via electronic mail, because the asynchronous communication mode has the advantage that they don't feel disturbed in their other duties,

"Just as e-mail has changed communication in business, it promises to alter the way professors and students communicate. For example, educators can offer "extended office hours" by way of e-mail, inviting students to make inquiries in a text-based mode. Since a professor's answer can be sent back to the student with the push of a single button 'reply', communication is faster and usually more clear than through use of telephone or voice mail." (Bold 1997).

In contrast to phone calls or mailed letters, Email messages can be sent to any number of recipients without additional efforts, so that professors can use them for contacting student groupings – or even their whole class audience. This built-in potential to switch from bilateral to multilateral communication makes Email ideally suited for teachers (who are practicing such switches anyway permanently in their classes).

The emancipative effects of downward digitalization on individual learners is particularly manifest in the realm of *scientific online publishing*, because the WWW offers highly accessible publication channels no longer controlled by professional peers and commercial publishers .

In the conventional world of paperwork, most term papers and other written student work have no other function than to generate the necessary academic credits. They were read and evaluated exclusively by the teacher responsible for handing down credit points and grades – and even this reading was often enough quite minimalistic, because most teachers are flooded with papers at the end of terms, and most texts are uninspiring because they just replicate arguments and findings with which the teacher is already quite familiar.

Even many Ph-D. works (and in some European countries also works written for Habilitation) show clearly that the main goal of its author was to impress the prospective academic evaluators (most often residing at the same Campus), not any other public. This is manifested in their usage of technicalities which are only honored within such local academic subcultures, and in linguistic style too academic to be attractive to any larger readership (especially from non-university settings).

Instead, the digital media provide ample opportunities for all students to feed everything written into larger networks: at least by distributing their texts to colleagues within the campus (by mail-lists, intranet-uploading etc.) or by making them globally available for free on the WWW.

Of course, such perspectives can increase the general motivation of students

- 1) to invest more time and energy for producing sophisticated and carefully written “papers”;
- 2) to focus on new, highly original (or more specialized) topics where they feel able to make a “real contribution”, instead of dwelling on issues treated by hundreds of other students in almost identical fashion;
- 3) to use a rather comprehensible language free from jargon and technical terms: so that their work can appeal to a larger and more heterogeneous public.

“When asked the value of supplementing their world history studies with this time-consuming technology activity, students report that, because they are presenting their work on the Internet, where it can be viewed by anyone around the world, they have to be clear, accurate, and thoughtful in their analyses and presentations. As one student put it, ‘Because I’m teaching it to someone else, I really have to understand it myself.’” (Fulton 1998).

Evidently, such opportunities to enlarge readership may be more appealing to social scientists which often have very large (and mainly nonacademic) potential publics, than to highly specialized physicists which can as well circulate their outputs on exclusive mail-lists because they know all possible recipients in advance.

But even in these highly technical fields, students may try to penetrate networks controlled by highly advanced and reputable senior scientists: e. g. by providing contributions which focus on new, hitherto neglected issues.

Given their relative independence from institutionalized “Big Science”, students may well be able to enrich the “variety pool” of alternative research topics, theoretical views and methodological approaches, while advanced scientists may often lack the freedom to sidestep mainstream research lines because of their concerns to get fundings or to advance their academic career.

There are reasons to assume that online publishing may diminish the degree to which the status and attention given to academic publications is guided by peer-review judgments (or other procedures designed for creating highly stratified systems of scientific “reputation”).

The main impact here may stem from search engines, because they allow users to select texts which respond optimally to their current needs, problems, interests and preferences, so that they have less need to guide their selection by the attributed reputation of authors, institutions or publishing houses.

This will especially be the case,

- when the topic is very new or highly specialized (e.g. about the sociology of Tennis or the subcultural practices among Inline Skaters)) so that even highly mediocre student papers may contain more relevant information than everything to be retrieved from “classical” authors or other reputable sources.
- when recipients are from outside academia: so that they lack information about who is “reputable” and who is not.

We will certainly see the honorable Peer Review Journals trying to denounce and discredit free online publications in their fields which have not passed such filters of professional evaluation. But this may not prevent such documents to receive broad worldwide reception, and an acknowledgment which is primarily based on their “*functional value*” to provide useful factual information, not on their “*reputational value*” derived from their conformity to professional “standards of excellence”.

As a consequence, the traditional one-dimensional ranking system characteristic for the attribution of scientific reputation will be supplemented (or partially substituted) by a much less consensual multidimensional system, because in addition to interdisciplinary peer scientists, various external evaluators will make their significant contributions:

“... given that the logic of cyberspace is participatory and interactive, the wider use of information/ communications technology enables research to be subject to a peer review which goes beyond judgments by colleagues in the same academic discipline to include research subjects and stakeholders.” (Usher/Edwards 1998).

Nevertheless, it may well be doubted whether such emancipation from traditional peer controls or economic hurdles does result in unconstrained intellectual freedom, because the new online environment may well give rise to alternative conformity pressures which are less anchored within the academic system.

Thus, while the Internet certainly empowers each individual to choose about an innumerable variety of information sources and to follow his/her own particularistic course of learning, it is nevertheless also contributing to a growing collectivization of human knowledge: by obliging everybody to embed his own empirical contribution into the already existing web of information and to relate his own theoretical arguments to already spelled-out thoughts.

Given the tremendous (and certainly ever increasing) capacity of search engines to retrieve the most relevant documents and resources within seconds, it is safe to conclude that within scientific professions, strong social norms and expectations will soon

emerge which oblige students and professors to make full use of these new capabilities.

As a result, a new “academic conservatism” may easily arise in the sense that all assertions within a scientific document have to go along with explicit references to their “original” sources, so that unembedded statements will be judged to “lack seriosity” and authors may feel discouraged to present any kind of self-created ideas.

Insofar as the references consist in links to other online documents, they are also far more salient and consequential than traditional bibliographic references in paper publications, because every reader can easily check on the spot whether these sources really exist, and whether citations are correct and really to the point.

The trend toward collectivized intellectual creations with supraindividualized authorship is also facilitated by the ease with which authors can include passages from foreign documents by “copy and paste”; and by groupware facilities which allow various individuals to work on the same documents (e. g. technical blue prints, synoptical tables or musical compositions).

All this of course collides with the high-level norms of individual authorship which demand that every text

- 1) is attributable to specific authors personally responsible for its content
- 2) stands out as unique original creation against all other texts, so that all “plagiarism” shall be avoided.

Both of these fundamental norms are increasingly difficult to maintain when authors recognize in the course of their work that previous authors have already treated exactly the same topic and expressed the same thoughts in rather adequate (or even: unsurpassable) ways. Many of them feel obliged to give their products a superficial appearance of originality by simply changing words, grammar or stylistic expression, so that they easily escape any risks to be sanctioned even if they reproduce exactly all the relevant ideas.

While “plagiarists” who don’t mention the sources will certainly always be stigmatized (or even suspended from universities when they are enrolled students), we may nevertheless see a certain weakening of the old individualist principles of intellectual production in the near future. In particular, it may become commonplace to give credit also to compilative products that do not pretend to be original individual creations, but only skillful syntheses of already existing contributions.

In fact, the richer the wealth of information and data sources on the Net, the higher the need for “Net-savvy” scholars who provide reliable guidance through this thick and ever changing jungle, and the more likely that more esteem and reputation will be granted to teachers and researchers who know how to *reduce* this complexity (by providing selection criteria) than to those who *increase* it by additional creations of their own.

Finally, it is evident that besides promoting the autonomy and discretion of individual learners, downward digitalization practices can also be used to increase the autonomy and self-organization capacities of learning collectivities: either by reinforcing the cohesion of formally constituted groupings (like lecture or seminar classes), or by facilitating the emergence and establishment of additional informal “learning communities” that may connect and socialize members from different classes or institutions (or even: from various countries or continents).

Compared with face-to-face groups where everything said tends to evaporate in the air, groups which rely on online communication have an increased capacity for endogenous self-structuring and self-organization because everything what has ever been communicated can be perpetually stored and readily retrieved (Graebner 1998). For

learning procedures, this implies for instance that each student can easily keep his personal "history of failings and mistakes" in order to do the maximum for avoiding them in the future, and that learning groups can as well nourish collective pools of "frequently committed errors", so that current novices may be better able than the initial members to avoid them right from the start.

Making use of such memory features, online teachers may be able to save time by providing standardized answers to "Frequently Asked Questions", so that they have no longer to repeat the same things to many different students (Guernsey 1998).

The more such collective auto-referential orientations prevail, the more each particular learning group will develop in a unique and unpredictable way, and the more divergent will be the outcome of different courses, - even if teacher and basic learning materials are the same.

"Some connected learning courses, for example, use hardcopy textbooks and course materials, just as if in a physical classroom, but the virtual classroom world is entirely comprised of a Chat Room and a Discussion Thread environment. Every course is unique and invigorating to the professor because the discussion threads are never alike. And at the end of every course, the virtual content is "thrown away" and the next class starts with a clean screen." (Everhart, 1999)

Thus, while standardized online courses may contribute to a growing convergence of teaching procedures and learning results, such effects may be more than neutralized by the strong tendency of interactive online groupings to produce endogenously their own idiosyncratic identity and evolution.

This capacity for endogenous knowledge accumulation (and knowledge refinement) is particularly useful when the task is to acquire intimate knowledge of particular objects or situations (e. g. about a specific planet, country, patient, organization, biotope or archeological location).

The more use is made of this self-organizing capacities, the more online groups can become real "learning communities" that tend to develop a distinct collective identity by accumulating their own knowledge stocks and normative traditions. (McLaughlin, 1997; Le Cornu/White 2000).

At least under asynchronous modes of communication (e. g. by email), the collective group memory can be extensively used, so that individual participants will anchor their postings in various past communications, not just in the most recent contributions as it is usually the case in face-to-face interactions. (When online communication is synchronous however (e. g. in chats), the same "recency effects" as in offline group discussions can be observed).

On a highly general level, it could be maintained that online communications increase the degree to which social structures and social organization can be based on the "fluid" medium of interpersonal interaction: thus diminishing the reach and impact of "solid" media like physical locations or formalized programs, rules and procedures (Geser 1998; Geser 2001:12).

As a consequence, online media could very well contribute to an ongoing fragmentation of universities, institutes and teaching programs into highly autonomous informal groups kept together by common learning histories and shared collective pools of knowledge, language habits, theoretical outlooks, methodological approaches (or even more fundamental paradigmatic premises and scientific goals).

In contrast to the educational commodities produced by "upward digitalization" which give rise to supplier-customer relationships similar to many other spheres of economic transaction, it might be concluded that all these decentralizing and informalizing effects

of online education diminish the degree to which students are like “consumers” whose only role is to receive a product and go away with it after payment. Instead, online education is a process in which all participants have to be real “co-producers”: actively engaged in asking and answering questions, proposing issues and data sources, criticizing and correcting colleagues etc etc.

Consequently, the new interactive teaching models may well be resisted by students who have see themselves as incumbents of merely consumptive roles who “buy education” like they pay for a haircut, a legal counseling or a medical treatment:

“Students are likely to resist the new teaming models as much as the instructors. In the virtual learning space, students are as much responsible for the quality and amount of learning as the instructor. This is a fundamentally different way for students to think about a course; traditionally, students are accustomed to thinking in terms of what they get out of a course rather than what they contribute to the knowledge created in a course.” (Leidner/Jarvenpaa 1995).

4.3. On the growing divergence of epistemological models of knowledge and learning

While all these highly divergent uses of digitalization and virtualization may well be primarily motivated by administrative or economic constraints and by didactic and curricular considerations, they are nevertheless also intimately related to premises on higher methodological and epistemological levels.

On the one hand, the online media are apt to reinforce the “*objectivist*” *model of learning* which is based on the assumptions that knowledge is stable and consensual because it mirrors an objective reality, and that the main function of teaching is to transmit knowledge efficiently from a few experts to many learners.

This model provides the rationale for making huge investments in standardized digital learning procedures, and for designing sophisticated online curricula which will pay out because they can be applied in the same way during infinite time everywhere on the world - unaffected by any divergences of between collective cultures or individual minds. By incorporating their knowledge and thinking styles into digitalized courses, at least some few highly reputed academic professionals (and institutions) will be able to exert much more authoritative control over what (and how) many others learn than most professors have hitherto exercised by magistral lectures.

On the other hand, online media can as well be used to support and amplify “*constructionist*” *learning models* which emphasize that knowledge is not something finished merely to be transmitted, but something actively created by each particular learner (Jonassen 1993; Yarusso 1992; Leidner/Jarvenpaa 1995). This model is certainly supported when online learning environments are designed in terms of hypertextual structures (like the WWW), so that every user can follow his individual course of learning: by selecting, interpreting, criticizing and synthesizing information according to his own judgments, values and goals.

Thirdly, online technologies are certainly highly supportive for “*collaborative*” *learning models*” which stress that knowledge emerges from interpersonal information sharing and discussion. (Slavin 1990) This “Humboldtian” paradigm can easily be reinforced by means of online fora that encourage highly decentralized multilateral discussion, and by applying sophisticated groupware which is designed to facilitate all kinds of goal-oriented collaboration.

Finally, the new media can also be used for enhancing “*socio-cultural*” *learning models* which assert that all meaningful knowledge is contextualized knowledge: produced, specified and transmitted within a communal collectivity of participants who share the same cultural background and the same intellectual tradition. (O’Loughlin, 1992). This most relativistic view of human knowledge (widely accepted in the humanities and some social sciences) can well be amplified by digital technologies: particularly by supporting the emergence and stable functioning of online communities which declare themselves committed to highly specific cultural traditions, which use storage and archiving facilities for the remembrance of group history and for fortifying their particularistic identity, and which are successful in keeping their core participants perpetually integrated (irrespective of their widely dispersed and changing geographical location).

Because all of these knowledge models demand highly different uses of the new media, they have to be chosen with care and communicated very explicitly before learning processes start. This contrasts highly with the traditional face-to-face teaching where the models could well remain implicit, because they could be changed without notice and effort within the ongoing processes of communication.

Thus, the online media will have the effect of forcing teachers to spell out clearly *ex ante* their epistemological positions related to science, truth, knowledge and learning – thus facing the risk that these choices are at variance with those of other teachers or with the official philosophy of their academic institution, or that they are not (consensually) accepted by their students.

5. On the potentialities, consequences and limits of aspatial and asynchronous academic education

While the strategies of upward and downward digitalization tend to heterogenize and fragment universities by their contradictory impacts on various academic individuals, collectivities and organizations, they may nevertheless also be the source of new overarching convergences and homogeneities in the academic system, because some of their functional potentialities and limitations and some of their causal consequences are similar or even identical. These convergences stem from the basic intrinsic capacity of digital computer networks to free human communication from the temporal and spatial restrictions of face-to-face interaction, and thus to increase the range of alternative options (for self-guided action as well as for mutual interactions) all participants have permanently at hand.

5.1 The increasing compatibility of academic learning with extra-university activities and roles

Online interaction is attractive for many students because it lowers their need to be present at a specific place at specific time. This is particularly salient for the rising percentage of students who are working part-time for supporting themselves, or for those who want to acquire additional certificates or degrees without giving up their current occupational career.

As empirical studies have shown, these liberties to choose time and location and to decide on one’s own pace of learning are seen as one of the most important ad-

vantages online learning has to offer: in many cases more important than the enlarged choice or improvement of learning resources (Newlands/Ward 2000).

“Why would people elect to take courses via videotape or over the Internet when classrooms are just a few minutes away? The overwhelming reason -- cited by students around the United States and Canada -- is convenience. On-line courses appear to be especially popular because they generally let students log in at any time of the day or night to send e-mail messages, add their thoughts to continuing discussions, take quizzes, or read a professor's lecture notes.”(Guernsey 1998).

As a consequence, all applications of online communication lower the threshold of university access for many population segments hitherto not included in the academia: thus contributing to the heterogeneity of skill levels, cultural background, individual values and educational goals to which university organizations have to adapt.

“What if part-time students working toward a degree after work, Chinese executives interested in Western management techniques, European farmers studying advanced agronomy and American retirees with the time to retake a favorite but forgotten Shakespeare course -paying customers all -- were just a modem away from class?” (Steinberg / Wyatt 2000)

Adding the condition that all these very different students have much freedom to structure their learning processes on their own, their highly divergent working styles, study skills and learning goals are penetrating the institution unfiltered, so that teaching personnel is challenged to react adequately to all their different preferences and demands. Consequently, universities will get under increased pressure to tailor programs and courses for the current needs of various people seeking enrollment from many different places and institutional settings, and who may be pursuing many different goals. On the one hand, they may have to adapt more to individuals exclusively driven by intrinsic motives of life enrichment and self-actualization, and on the other hand, they may have to offer highly specific “portfolio-education” (Dale Spender) for individuals who are searching ad hoc – support for the solution of work-related (or other practical) problems. (Uys 1997).

Given the increasing complexity and variability of educational proceedings and goals, people are also likely to use the services of “knowledge intermediaries” who are specialized to find out which academic institutions are best able to provide support for what categories of clients with what kind of current informational and educational needs (Radford 1997).

Such trends toward “just in time learning” may result in an increasing blurring between

- *educational processes*, which demand a relatively intense and generalized teacher-student relationship during a prolonged period of time
- *and*
- *counseling processes*, which only demand highly specific contacts between professionals and clients at certain points of time.

In the longer run, the online media may also pave the way to a better mutual adjustment (or even fusion) of explicit school knowledge and tacit work-related knowledge : thus supporting current lean production philosophies and the rise of “grey collars” who combine these mental and manual activities that have been increasingly separated in the course of classical (e. g. Taylorist and Fordist) industrialization. Such goals are explicitly pursued in the “Virtual Science Park” (at the university of Leeds) where the manifold channels of online communication are combined in order to

create such “hybrid” kinds of academic-occupational qualifications. (Gibbons/Hillard 1999).

It is fascinating to see such efforts concentrated especially in England: the country of Francis Bacon and James Watt which has always contributed so much to the blending of theoretical and applied knowledge for fuelling the process of technological innovation.

5.2. Asynchronous online communications as a bridge between oral informality and written publications.

Conventional academic communication is characterized by a polarization between two very different spheres: the realm of highly interactive face to face communication and the world of (almost) non-interactive written publication.

Given the highly consensual premise that all scientific ideas and results should be subjected to lively and widespread discourse among scholars, the shortcomings of this bimodal communication system are very evident:

1) While synchronous oral communication allows highly flexible feedback, it can handle only low complexity, because

- participants are forced to react immediately to previous speakers;
- longer statements are colliding with the talking need of other participants (or simply with limited time);
- oral contributions are not recorded, so that participants always tend to react to the most recent previous statements, and discussion outcomes often evaporate because they are not harvested and stored in systematized and accumulative ways.

2) While written publications give authors large space and time to elaborate and systematize highly complex ideas and to give much care to their verbal expression, they all tend to become monologues only marginally subject to interactive discourse,

- because written texts are irreversibly fixed on paper, so that they cannot be readily modified for simple physical reasons;
- because “publishing” typically means: distributing the work to unknown anonymous recipients who have no feedback channels at hand.
- because reactive statements (like book recensions or replicas and duplicas in scientific journals) are usually published at a later date and segregated from the primary publication to which they refer.

Seen in this general perspective, a major significance of the new digital media lies in their capacity to fill the large gap between these two highly divergent channels of verbal expression with a manifold of intermediary modes.

In other words: one of the most important functionalities of asynchronous online communication may be its potential to combine the flexible interactivity of oral talk with many advantages of writing: e.g.. with the capacity of participants to think thoroughly before they speak, to refer to all previous statements and to elaborate and transmit complex arguments, and with the capacity to store everything what has been said and to systematize the results of all previous discussion.

It could well be maintained that since its inception in the 16th century, science has always been an enterprise which was objectively in need of such media like the Internet, because it has the goal of submitting highly complex, reflexive and systematized knowledge to intensive (and extensive) critical discussion. This would imply that in the

future, scientists will not only adopt the Internet as an additional alternative mode of communication, but that they will give it the most central role: by at least partially substituting too ephemeral oral talk on the one hand and too rigid paper publishing on the other.

The communicative deficiencies of traditional science is also permeating the conventional world of academic learning, where the traditional polarization between highly sporadic oral communications (within or between courses) on the one hand and book reading on the other has never been optimally suited for acquiring complex knowledge within an environment of intensive interpersonal communication.

Thus, it has been found that

“Even when students are seen in their school by a university lecturer, conversations are often short and usually focus on immediate classroom practices and events of the day. However, such constraints, are not conducive to serious reflection on teaching. They do not allow the time to engage in the kind of discourse that is argued is necessary to facilitate the development of reflective, inquiry-oriented teachers.” (Le Cornu/White 2000).

This may explain why many “distance learning courses” are accepted eagerly by many residential students, because online interaction gives them a chance to satisfy many needs which have not been sufficiently met in the conventional campus setting.

“By designing around asynchronous assumptions, distance learning can become a rich, varied, and highly effective modality, so much so, in fact, that the college or university may well see a need to design the on-campus educational experience modularly and asynchronously so that on-campus students can enjoy as rich an experience as the off-campus student.” (Stahlke/Nyce 1994).

In sharp contrast to the highly spontaneous oral communications occurring in seminars (or in short informal encounters between courses), Email communication encourages verbal exchanges which are well thought out and diligently expressed, because writing invariably invites senders to systematize and spell out clearly their own thoughts, and to review them self-critically before they are transmitted (Le Cornu / White 2000).² Such “teaching by writing” procedures may well be abhorred by highly extraverted, “Socratic” personalities who need lively immediate contact with students for producing innovative and well explicated ideas; but on the other hand , they may be enthusiastically welcomed by more introverted scholars.

As we all know, academia today is currently dominated by professors who have been hired not because of outstanding faculties in oral teaching and discussion, but in consideration of their significant research performances and their reputable written publications.

This is readily explained by the fact that at least during their critical formative years, young researchers have to behave in a rather introverted fashion: reducing their social contexts in order to concentrate on what is most important: their personal scientific work.

For such researchers, online modes can be helpful by giving them an opportunity to base also their teaching activities on written instead of oral communication: thus allowing them to bridge teaching and research roles much more tightly than in the past.

² In their empirical study on teacher education students in Southern Australia, Le Cornu and White have found that a majority of students proof-read their email messages before sending them away (Le Cornu / White 2000).-

“A potential advantage of the virtual world is that the more introverted personalities tend to communicate better in written form than verbal, and they tend to compete on a more equal intellectual footing. They become more involved in a digitized discussion threads or chatrooms than they do when faced with potentially intimidating and more exuberant peers in the classroom.” (Everhart 1999)

For instance, they can easily feed excerpts from their own scientific works into their digital courses, and on the other hand, online communication may encourage them to create texts, conceptual schemes, tables and figures they can integrate into their scientific publications.

More than that: we will see much more “Humboldtian crossovers” of the two hitherto quite separate spheres of academic life: e. g. research projects explicitly designed for educative purposes, - and of course: teaching courses tightly integrated into current processes of research.

5.3. The deficit of nonverbal cues and the rising importance of writing skills

Face-to-face learning groups like school classes are “self-integrative” in the sense that all participants see, hear (or even smell) the congregation as a physical entity with clearly defined boundaries in space and time. As a consequence, they all feel themselves spontaneously as members of exactly this particular social collectivity, and all know that all others feel the same.

In the case of online groupings, no such self-integrative mechanisms based on nonverbal social perception are operating. While participants may intellectually know who else is belonging to the same learning group, they are not able to “see” the group in a physical sense. Consequently, they may be more inclined to perceive the learning collectivity as a network of interrelated individuals, not as a supra-individual entity endowed with its own identity goals and evolution. (Geser 1998).

On the other hand, participants may well preserve their psychological need to be members of a “virtual community” which provides them with a sense of belonging, and with a framework for meaningful cooperative interaction. In fact, the success of online learning groups have been found to depend critically on the provision of an artificially created “virtual identity” that has to be based more on rather specific common goals or cultural traditions, because it cannot be based on the generalized basis of spatial togetherness and mutual perception.

This could mean that online communities are likely to break up when consensus about common premises or goals is waning, while colloquial groups can easily survive by simply changing their purposes or activities. This “resilience” of face-to-face groupings may be even more pronounced when members are regularly engaging in common eating, drinking, gossiping or other emotionally rewarding social activities, because they then can easily develop a cohesion which can neutralize almost any dissensus (or malperformance) on the level of opinions or goals. (Silverman, 1995; Issroff and Eisenstadt, 1997; Horgan, 1998).

Similarly, interindividual online relationships have to rely on artificial substitutes that compensate the deficits of nonverbal communication.

Under face to face conditions, social interactions are heavily influenced by mutual visual and auditive perceptions. Whatever is communicated verbally is interpreted by taking into account many nonverbal cues: e. g., the gender, age or personal appearance of

the speaker, the precise tone in which something is said, or the gestures, gazes and mimic expressions displayed by the speaker.

In online settings, especially the more variable forms of nonverbal communication are completely lacking, and sometimes even very basic status characteristics of individual senders (like age and gender) are not known by the recipients. Consequently, the interpretation of all messages has to be fully based on the intrinsic meaning of their verbal content so that writing skills become the single most decisive factor for successful teaching and learning alike.

“One would normally expect that students with better standards of written language skills would benefit most (and most easily) from the Virtual campus system. Students and staff alike develop ideas and impressions of each other through their written communications. The method by which students and staff get to know each other depends on how each communicates in the written word. This often creates many great disadvantages: it lacks physical expression, ironic or worried or whatever a slight facial sign or expression could mean. It results in misunderstood and misinterpreted messages.” (Aparicio-Valverde et. al. 1996).

Thus, the whole meaning of E-messages has to be inferred exclusively from their intrinsic verbal characteristics, because absolutely no nonverbal cues (like tone of voice, mimic or gestic movements etc.) are provided that would help to specify their interpretation, evaluate their credibility or to judge how much importance is attached to them by the senders.

Given that nonverbal cues are especially potent in providing meta-communicative hints needed for interpreting and contextualizing transmitted first-order communication, the meaning of online messages often remains ambiguous as long as such second-order information (which can only be provided in the same explicit forms as the primary messages to which it refers) is not supplemented.

“The lack of tacit cues in this written group interaction dictates compensatory practices: the only tacit sign we can transmit is our silence, a message that is both brutal and ambiguous. . . the solution to this dilemma is explicit meta-communication... participants must overcome their inhibitions and demand further information. . . request clarification of emotional tone and intent.” (Feenberg 1989).

Therefore, e-communication is most adequate in cases where learning tasks and objectives are clearly defined and where words have a rather precise and consensual meaning, so that there is no need to provide additional specifying cues. (e. g. Silverman 1995; Austin 1997; Wilson/Whitelock 1997).

For the same fundamental reasons, online communication can be very efficiently used in highly homogeneous and long-standing groups where a rich pool of shared interpretations has been developed in the past, while newly formed and/or heterogenous groupings have to rely more on face to face gatherings because these provide far superior capacities for dealing with imprecise and ambiguous communications.

From this, it can safely be concluded that classes, research teams or any other academic groupings will enlarge their capacities to use online communication during time (Zack 1993); (or the other way round: that rather stable and permanent groupings have to be established when maximum usage of online communication is a manifest goal. While the *initiation* of even very strong interpersonal relationships is not precluded, their development and maturation takes usually longer because most communication is asynchronous and a smaller range of different stimuli can be transmitted during a given period of time. (Wellman/Gulia 1995).

As more diffuse information about individual behavior and idiosyncratic personal traits is lacking, the interpretation of online messages is often highly conditioned by infor-

mation about formal status characteristics – especially at the beginning of exchanges when the communicative competencies of various members cannot yet be assessed. For instance, critical remarks against a reputable author may have much more weight when they are known to stem from a highly experienced senior researcher, and orthographic mistakes are less likely to be taken as an indicator of low mental skills when they are known to be committed by a recent immigrant from a far country. Therefore, it is to be expected that many online groups try to increase mutual interpersonal knowledge by exchanging detailed biographical information before communication is started., or by starting online courses with an initial period of face-to-face interaction, so that participants can become sufficiently acquainted (Gibbons/Hillard 1999). Another alternative is exemplified by a group of business professors at the Nova Southern University (NSU) who used biosketches in order to create a rather high initial level of interpersonal acquaintance:

“The three authors all begin their classes by sending out a personal biosketch and asking students to do the same. Rather than presenting the instructor’s credentials, publications, and experience in teaching the course, the biosketch is designed to get to know one another as people. Yes, we do include the above information, but also talk about our families, hobbies, and dogs. After students send in their own biosketches, they are required to comment on each other’s biosketches, in effect having introductory conversations. Common interests are discovered and initial conversations may center around things like favorite movies and pastimes. The biosketch also gives the instructor the decided advantage of knowing the work history of each student so that pertinent bridges can be built from course material to individual experience.” (Gibson, Tesone, Blackwell 2001).

While such artificial devices may help to overcome certain deficits in mutual physical perception, they nevertheless articulate the basic characteristic of all online communication: that all cues transmitted have to be coded in terms of digital symbols and transmitted intentionally, and that communication flows are extremely dissociated from all physical, behavioral and psycho-social contingencies of individual emitters and receivers.

5.4. The higher need for self-guidance and self-motivation

One of the most important (and most neglected) “latent function” of residential social systems is that by bringing individuals together at the same time on the same location, they draw students in a dense social field where social control is exerted, norms are enacted and effects of “social facilitation” are produced: thus activating even rather disinterested students to a degree that sustained learning efforts occur.

Virtual university programs instead have in common that the deliverance of knowledge takes place without simultaneous social interaction: so that students have access to learning materials anytime and from any places.

As a consequence, such courses have the basic effect of isolating students from the social university context, so that the many latent functions of such social settings (=creating and sustaining motivation, providing opportunities for socio-emotional interaction and the establishment of social networks, informal oral contacts with teachers or other students etc.) get lost.

All “distance learning” is ridden by the handicap that such school-specific motivation and socialization effects cannot occur, because students remain embedded in their own non-university contexts where they may be distracted by nonacademic concerns. Thus, disciplined and sustained distance learning is usually tightly correlated with the level of subjective commitment and self-control, because the learners themselves have

the task of providing the necessary psychological energies and of constantly shielding themselves from distractions.

To the degree that the time management of the studying process is no longer provided by formal organizational schedules (or informal group meetings), it has to be generated and maintained by each student himself.

“.....these classes tend to circumvent scheduling problems by allowing learners to make choices as to where and when they study and participate. This can also be the Achilles heel for some of the more disorganized in the student population. It’s just too easy to put off study with all the freedom technology provides. Perhaps the biggest problem is going to be letting tasks and time get away. A high degree of time management skills are needed for assured success.” (Reid 2000).

Consequently, distance learning will tend to stratify student bodies sharply along the lines of factors like protestant work discipline or self-directed cognitive motivations: marginalizing all those which are dependent of external discipline because they have not acquired such internal dispositions in their previous socialization (Hiltz 1988). Consequently,

“The lack of enabling conditions such as student experience, student ability, and student effort may outweigh any gains to be achieved with technology and thus should be examined before widespread investment in advanced technology.” (Leidner/Jarvenpaa 1995).

Secondly, distance learning will favor students who are integrated in other dense social fields which stimulate or force them to engage in sustained learning activities – like in the case of corporate employees who are encouraged by the firm to engage in courses of advanced training or to acquire additional academic degrees (e.g.. the MBA).

This is the reason why the most successful endeavors of distance learning are in the field of corporate education:

“...it appears that the initial type of students to whom companies are marketing their web-based education to are those pursuing specific degrees – such as an MBA, and those that are engaged in continuing education or professional certifications.” (Barlow 2000).

5.5. From Input Measures to Performance and Output Measures of Study Success

Given the growing heterogeneity and variability of study schemes, study processes and outcomes, it will be less and less possible to base any forms of credits or credentials on behavioral measures.

While in the past, an individual could draw a lifelong reputation from his “time served” at Harvard (without having to prove anything he has learnt there), such attributions will no longer be viable when genuine Harvard degrees can also be acquired by distance learning (or by various combinations between offline and online study phases).

Likewise, it will ever look more queer to make regular physical attendance of classes a prerequisite for the attainment of credit points, because this would undermine the new philosophy that similar (or even better) study result can be achieved by utilizing computer-supported learning modes.

A major reason why online courses create more work for teachers stems from the fact that simple indicators like physical presence are no longer available for verifying

whether serious studying is taking place. (The suggestion to take login-time as a surrogate is certainly not viable because nobody can know what students are really doing while being technically connected to the course).

Instead, student participation can only be ascertained by measuring and evaluating more sophisticated variables: e. g. the number or volume of messages posted in online discussion, or the amount of responses evoked by such individual contributions.

“Since attendance cannot be monitored as it could be in the traditional classroom, other methods of ensuring a student’s involvement must be implemented in cyber classes. For example, emailed weekly assignments or organized online chats are some of the ways this can be accomplished. This way of maintaining student participation engages the student in way that proves more effective than simply taking attendance. Since it is monitored, a professor can feel assured that his or her students are participating outside of class, where much of the learning process takes place.” (Barlow 2000).

The lower the applicability of attendance and other mere *behavioral* criteria, the higher will be the need for valid *output* criteria for judging student performance, for referring reputation and for exerting social intra-academic social controls. In other words: Harvard degrees will draw their prestige no longer from the time period spent at this same university, but exclusively from the graded achieved in courseworks or examinations – regardless of the kind of study methods used (Uys 1997). Consequently, there will be an increased pressure on universities to objectify teaching results and learning outcomes on measurable scales – which will evidently lead to embarrassment in all disciplines in which no codified and canonized knowledge bases and non consensual standards of excellence exist (e. g. in the humanities).

This again shows how the application of digital media will widen the gap between different scientific fields. While the disciplines with highly structured and consensual paradigms and highly consolidated stocks of knowledge will readily enact multiple choice tests and other “positivistic” instruments for measuring individual qualifications, less consolidated disciplines will have more difficulties than ever to produce valid study success measurements and widely acknowledged certifications.

5.6. Somewhat fuzzy new roles for university teachers

Not even the fiercest advocates of “automated academic teaching” would anticipate a stage where the number of academic teaching personnel could be considerably reduced. Instead, most serious writers on the future of virtual universities agree that while there may be a considerable shift from direct knowledge transmission activities to more auxiliary (e. g. supportive) functions, the total work load of teachers may well be even higher than under traditional low-tech conditions.

1) Providing motivational support, structuring and social control for distant students

For many students enrolling in online studies, the absence of all the motivational and controlling factors associated with class attendance and face-to-face gatherings means that they feel themselves in a social void: unable to generate the self-discipline necessary to maintain regular studies in the presence of all surrounding distractions. For fighting such “entropic” tendencies, it is necessary to facilitate disciplined learning by not only offering the online material in highly structured form, but by providing additionally intensive feed-back, frequent evaluations and regularized social controls.

“Our experience with self-paced classes is that only the most highly organized and motivated students complete their work and do well. Others get further and further behind. Chunking the work, breaking it into smaller component parts, and establishing absolute deadlines is probably the single most important piece of advice we can give any new online professor. From the beginning, set weekly modules of work and stipulate due dates clearly. We even have interim due dates within each week when certain components of the week's work are due. For example, if you give a bulletin board assignment, have it due about day four. That way, they have the rest of the week to discuss each other's answers. Reinforce this regimen by giving weekly feedback on grades. We have found that the latter gets the attention of students who start falling behind, and they quickly get into the rhythm of the class.” (Gibson/Tesone/Blackwell 2001).

“Consultantss” have the more instrumental roles of presenting and explaining the inline materials, clarifying ambiguities, monitoring discussions and evaluating test performances.

“Concluding from the scenario-studies and constructivistic learning theories, the profession of the teacher will shift from transferring knowledge to guiding learning processes It has to do with the fact that information is increasingly available in the present (knowledge) society. Moreover, information is dating so rapidly that education cannot keep on focussing on the transfer of knowledge any longer. Instead, it becomes more important that students learn how to search, select, process and use information. The teacher mostly has to guide these processes. (Jager/Lokman 1999).

By contrast, “tutors” fulfill more socio-emotional (especially: motivation-related) functions:

“The tutor is the main point of communication between the university and the student who works alone at home most of the time (as is the norm with distance education). The tutor is there to provide a point of social reference and to ensure that the student feels part of the university community despite the geographical remoteness of the student from the physical university campus. The tutor is a key figure in overcoming the traditionally high level of student drop-out rates in distance education. Many students fail to complete distance learning courses simply because of the isolation and lack of individual student support in distance education.” (Aparicio-Valverde et. al. 1996).

Thus, while university teachers have been freed from many chores of standardized instruction, they have to shoulder a heavier load of more informal duties of providing their services as the “human link” by which distant students can remain socially connected to the university.

Given the high autonomy of students to define their own learning courses and to decide when and how to participate in online interactions, it is evident that there is a need for “social facilitators” who are highly empathic to the needs and values of their clientele. Thus, empirical studies have shown that students engage more in online interaction when teachers take into account their specific cultural characteristics (Bracewell 1998; Silverman, 1995; Austin, 1997),

And considering that virtual distance education usually has the effect of attracting a more heterogeneous flock of students (because entry is facilitated for older age cohorts, ethnic minorities, people with rural background etc.), it is evident that such services are very labor-intensive because they have to be tailored to many different individual needs.

“Even the best teacher finds it a monstrous difficulty to individualize lessons for each student in any classroom. Students are at different learning levels, and dedicated teachers struggle continually to surmount this immense obstacle. Theoretically, when using computers, teachers might assign different students to different parts of lessons depending on the progress of pupils. That, however, would require that the teacher be able to analyze accurately the condition of the learning of thirty students on that particular day and know the intricacies of the computer lessons with uncanny thoroughness.” (Bennett 1996).

Especially operative tutoring tasks can become so burdensome that teachers have no time and energy left for more “strategic” purposes: e. g. for evaluating and selecting new digital media products or participating in the development of virtual campus curricula (Bennett 1996).

“Teachers who have taught with computers agree that - at least initially -most uses of computers make teaching more challenging. Individualizing lessons, matching software to curriculum, scheduling student computer time, monitoring use, providing assistance, and troubleshooting - all add burdens to the teacher's time... The net effect is increased demand on teachers' time and creativity... very few teachers have adequate time for planning and preparing to use technology.” (U. S. Congress, Office of Technology Assessment, 1988).

In addition, the conclusion seems warranted that the socialization and education of such consultants and tutors is no easy task, because highly generalized personal and social competences are needed (which certainly cannot be generated by virtual teaching courses).

In other words: . the more all standardized teaching duties are eliminated because the transmission of highly established knowledge is delegated to online courses, the more the remaining social roles and interactions assume a character of diffuseness and informality: so that university teachers will need more “extrafunctional” skills similar to those demanded from lower grade teachers.

Thus, to move away from standardized conventional teaching modes means to sail into uncharted waters where no clear norms and procedures are institutionally defined. Consequently, teachers are constantly facing ambiguous situations which demand quick decision based on intuitive judgment:

“One of the dilemmas the teacher has to cope with is whether he should ‘direct’ students learning processes or ‘leave students at their own devices’. A student has to work as independently as possible, but when should a teacher intervene? And in what way can a student accomplish the best (independent) learning activity? How should the teaching-learning process be formed to establish the best learning achievements?” (Jager/Lokman 1999).

At least when strategies of “upward digitalization” are prevalent, it may be predicted that the present traditional polyvalent role of the teacher who combines strategic tasks of designing courses with operative tasks of giving courses will vanish in the same way traditional handicraft roles have eroded: because the strategic tasks are monopolized by a more exclusive stratum of highly professionalized “knowledge engineers”, while the operative tasks associated with concrete students and learning processes can be given to relatively unqualified personnel: more equipped with social competencies than with broad knowledge and high academic reputation. In many academic settings, these new functional divisions will penetrate faculties and institutes: leading to painful inequalities in the chances of different professors to gain income, recipients and international reputation (Steinberg / Wyatt 2000).

2) Recontextualizing knowledge

To the degree that knowledge becomes increasingly codified and decontextualized by incorporating it into digitalized forms, local teachers may find new a new role in recontextualizing it by relating it to the specific needs and skills of their students and the particular conditions of its practical application.

Freed from the boresome chore of transmitting highly canonized knowledge in a repetitive fashion, local teachers (and local universities as a whole) will have more time and energy left to specialize on hitherto neglected functions of interpreting knowledge in terms of local cultural patterns, relating it to current situational circumstances, and of making it useful for solving locally salient problems.

This is exemplified by the “Open University of Catalonia” (Spain) where discussion forums were used for applying economic theory to current issues of national policy:

“The discussion-debate space also allows the incorporation of up-to-date, real life matters in the teaching of specific courses. For example, during the recent Spanish general elections consultants in “Economics” proposed a debate to analyse the outcomes of the economic policies of the different political parties. The same election was used on the “Introduction to Statistics” module to initiate analysis of the accuracy of the different opinion polls published in the daily newspapers preceding the elections.” (Aparicio-Valverde et. al. 1996).

3) Providing guidance through the “Cyberjungle”

The original (medieval) function of university teaching was to make available existing knowledge which could not be made available in the format of printed texts.

After Gutenbergs invention, and especially as a result of mass printing since the late 19th century, good lecturing has assumed a more selective function: providing guidance through the ever more encompassing literature by evaluating different publications, and by setting them in a context so that students were better able to get a synthetic view.

In the digital age, knowledge sources have become so manifold that learner feel at a complete loss when they don't get very decisive guidance. Thus, current teaching has become more and more a task of gatekeeping and of providing leadership by proposing pathways through the immensely manifold, disorderly expanding, and daily changing materials on the Web, on intra-campus networks and other digital sources.

Thus, the difference between old and new teachers is somewhat similar to the difference between music composers and disc jockey. Like composers, traditional teachers still create teaching materials ab ovo by producing their own verbal formulations and virtual presentations; like diskjockeys, new teachers make use already existing teaching units, so the value they add consists only in skillful selection and combination: thus “refining” data to information and upgrading information to real “knowledge” meaningful to all participants of a specific learning procedure.

More and more, the most precious services of teachers are of a negative nature: by telling students which knowledge sources they can safely ignore because they are irrelevant, mistaken, dubious, outdated or unfitting for any other convincing reasons.

“The huge amount of information available on the Net has changed the way in which we treat and consider information. While before the spread of the Internet information was generally a scarce resource to be carefully searched, in the Internet era information is superabundant and the problem is that of filtering relevant cues in a sea of

useless information. What is scarce is no longer information but attention.” (Mantovani 2001).

By adding the growing heterogeneity of students and the increasing individualization of learning strategies, it becomes evident that future teachers are valuable to the degree they are able to recommend the right sources to the right learners: in order to define the sphere of learning where they are best able to do fruitful tutoring.

The university may well decay in a multitude of microsocial, individualized teaching-learning relationships in which a fruitful symbiosis between highly particularized teacher skills and highly idiosyncratic learning needs can be (temporarily) achieved.

Evidently, these developments are very much in accordance with the old Humboldtian view of academic learning as a dynamic process shaped by teachers and students as equally productive participants.

Paradoxically, even the standardized multimedia products created by “upward digitalization” may contribute to these processes of decentralization and informalization, because these materials are just additional items offered for sale in an ever growing “eduware shop”: increasing the need for competent evaluators who are able to tell which items are most fitting for whom for what purposes at what moments of time.

4) The new pressure to be up-to-date

The more students have easy access to academic knowledge from their homeplace, the higher are their “opportunity costs” to get up early in the morning and to travel to the university in order to attend lectures. More and more, they will be hesitant to engage in such costs and efforts when they are not sure whether lectures provide some “intellectual surplus” not offered by any online procedures.

How can a lecturer remain attractive when all relevant materials are readily available online for all students alike?

At least one possible answer may be: by presenting new materials: by being the first in retrieving information which has come up so recently that it is not yet included in the canonized curricula, by evaluating critically its significance, by setting it into a relationship with existing bodies of knowledge, and especially: by making it a topic of discussion within the course.

Paradoxically, then, the most archaic medium of face-to-face communications seems most apt for dealing with the most innovative tasks of academic life, while the new online media may become a storage pool for highly standardized school knowledge always somewhat outdated because updating implies professional efforts, money and time. The more it becomes a normative expectation that professors as well as students consult the Internet when they are preparing lectures (or even when they are keeping them), the more there will be to keep pace with the most recent publications and to present information which is highly up-to-date.

(This resembles the pressure on weekly and monthly journals (or even the Encyclopedia Britannica) to install “newstickers” when they go online: so that their distinction vis-à-vis classical radio programs or TV stations becomes blurred).

5.7. On the persistent “latent functions” of residential universities

The notion that current residential universities could be replaced by nonspatial “virtual campuses” is naive also because it is most often based on the premise that the transmission of knowledge is the sole (or at least: the overwhelmingly predominant) function colleges and universities fulfill.

Sociologists have a special responsibility in clearing up this misunderstanding, because since many decades, sociology emphasizes that all social institutions usually fulfill a wide variety of different functions, many of which may be “latent” in the sense that they are not explicated in any formal charters and may not even be consciously recognized by the participants themselves.

Thus, it is essential to acknowledge that

“.....the efficient acquisition of knowledge is only a tiny fraction of what going to college means. Face-to-face interaction with professors, living away from one's parents, and socializing with a diverse group of people count for a lot in college education - and these experiences can't be replicated online. (Tweney 1999).

First of all, colleges and universities contribute much to the *basic personal socialization of adolescents and young adults*: by providing a context where they have the opportunity to accomplish a “rite de passage” by dissolving their primordial bonds to their parents and to establish new social relationships within teachers and peers.

“.... the residential version of the American college may have no equal in challenging the familiar; in challenging prejudices, and values; in creating uncertainties; in bringing about new ways of relating to one another. Its emphasis on socialization and peer interaction, in the eyes of many, make the college environment, as distinguished from the college curriculum, a formative and formidable experience that is valued in its own right, independently of any academic purposes. The rite of passage is one reason, anthropologically speaking, Americans go to college. It is, of course, only one reason, and it is not the reason anybody invokes to justify tuition.” (Casper 1995).

Secondly, all academic institutions are a breeding ground for many *interpersonal networks* which remain salient during whole life, and which may turn out to have a deciding impact on family life as well as on professional careers.

“There can be little doubt that, for all those who attended, friends and acquaintances from college and university constitute an important network in terms of social life, career developments, business, political connections. "We met in college" is, even in our day and age, an often satisfactory explanation for preferment. Universities have provided these networks since time immemorial, anywhere in the world and reaching across the world.” (Casper 1995).

While virtual learning procedures can certainly be designed to induce or facilitate new interpersonal contacts, it is not probable that these contacts will transcend the specific learning contexts in which they have been generated.

It is reasonable to assume that elitist strata will always prefer residential universities because they need them as meeting places for generating and maintaining intra-elite relationships and to reinforce intra-elite cohesion and solidarity vis-à-vis. lower social classes.

Third, colleges and universities have proven to be potent promoters of *multicultural societal integration*;: by creating bonds of harmonious cooperation between many population segments (e. g. ethnic minorities) which are very much separated in most other social institutions.

“Contemporary universities are characterized by a remarkable extent of peaceful interaction across multiple social boundaries. American universities may be the most diverse and integrated institutions in the world. In spite of occasional incidents that are played up in the press - indeed universities are no ivory towers and ... - there are few,

if any, institutions that are, comparatively speaking, more successful than universities at encouraging their members to cross bridges. Not to mention their extraordinary capacity to bring all ages together....” (Casper 1995).

It is hard to imagine how virtual education could contribute anything to such social functions – given the fact that it increases spatial distances and eliminates many occasions for the establishment of friendly interpersonal relations on the basis of mutually perceived and accepted differences of age, gender, ethnic or racial background. The reason is that in online communications, such status characteristics are usually filtered out: so that they may not even be mutually known – or if they are, they are not salient in the ongoing virtual interactions because physical characteristics are not visible.

Considering these secondary (or “unintended”) functions of academic institutions often ignored in technocratic discussions about academic virtualization, the conclusion seems warranted that at least in the realm of highly reputable universities, digital teaching and learning procedures will primarily serve to complement or even reinforce these traditional residential structures, not to replace them by distant learning.

Of course, different conditions may hold

- in the sphere of technical or commercial schools with a high vocational orientation, because their students like the opportunity to enroll in studies while remaining integrated in their companies and work settings;
- in rural regions and poorer Southern countries where tele-learning devices may well provide the only option for reaching and socializing widely dispersed students.

6. Conclusions

Analyzing the impact of the new digital media on academic institutions is an immensely complex endeavor

1) because universities are polymorphic institutions which are extremely traditionalistic and radically innovative at the same time., which combine highly authoritative and highly decentralized teaching and learning environments, and which are the habitat of disciplines highly diverging in all aspects of what they do and try to achieve: from their epistemological premises, theoretical outlooks and methodological approaches to the scope and purpose of their scientific research practices and the relevance of their products for culture, politics or the economic and technological sphere.

2) because the new media give rise to an almost limitless variety of new forms of information handling and interpersonal communication.

When these two complexities meet and intermingle, they are likely to result in a horrendous variety of heterogeneous and unpredictable developments which will undermine almost any endeavors of centralized management and formalized structuring, and which cannot be channeled into systematically implemented technocratic reforms.

More than that, the growing heterogeneity and variability of teaching and learning practices (between individual professors and students as well as between departments, disciplines and universities) will probably weaken or abort many already existing endeavors directed to standardize and homogenize the preconditions, procedures and outcomes of academic education. For instance, the range of different options for doing semester works, acquiring credit points or organizing examinations will increase: so that equivalences between different modes will be more difficult to define.

While the emerging global industrial production of standardized multimedia material and online curricula (“upward digitalization”) may further the further worldwide homogeneity (in knowledge contents, well as in didactical methods), it will also contribute to intra-academic fragmentation because such technological trends toward authoritative

knowledge implementation will increasingly clash with countervailing trends of student empowerment and informal collaborative knowledge production (“downward digitalization”).

By inspecting the overarching common impacts of these two highly contradictory developments, we might tentatively hypothesize that they both have the effect of *diminishing* the reputation and discretion of academic teachers and of *increasing* the autonomy and action capacities of students.

(Most) local university teachers are certainly threatened by **upward digitalization**, insofar as their modest personal knowledge and didactic skills will no longer be competitive with the high sophistication of online courseware produced by a globally active economic corporations and topmost professional elites. Instead of designing their own courses by selecting their own information sources and forms of presentation, they will increasingly become “knowledge dispensers” who specialize on mediating these standardized course materials to their students: by adapting “dosages” to individual needs and capacities just like pharmacists dispense industrially produced pharmaceutical drugs to individual patients, instead of mixing their own dubious powders and potions.

On the other hand, the same poor teachers may also lose status as a consequence of **downward digitalization** which forces them to communicate on a more egalitarian basis with their students. Instead of shielding themselves from informal interactions by celebrating authoritative top-down lectures and keeping highly regularized “visiting hours”, they have to deal with much unsolicited bottom-up email-messages, and to integrate themselves into highly informal, decentralized communication networks where reputation is not secured from the onset, but has to be acquired and maintained constantly by convincing contributions.

Students, by contrast, can profit from both developments in highly complementary ways:

1) **Upward digitalization** gives them more chances to behave like customers who chose their own course materials “from the shelf”, to determine their own hours of studying and their own pace of progression and to combine enrollment with almost any other (e.g. occupational) activities and almost any geographic locations and mobility patterns.

2) **Downward digitalization** gives them wide opportunities to become highly active and self-determinative in selecting learning material and learning strategies, to relate at any time interactively to co-students, teachers and researchers anywhere in the world, to become co-producers of knowledge by articulating their own analytic and synthetic talents within online discussions and cooperative digital productions, and in publishing their own scientific outputs without any professional, organizational or economic restraints.

If this analysis is accepted, shall we then draw the conclusion that current universities will engage in an antagonistic class war, where students are all eager to advance the application of digital media and teachers will all fight to preserve the status quo?

Considering the polymorphism of academic institutions as well as the individualism of its major actors, such expectations seem unwarranted, because empirical conditions are far too complex, ambivalent and variable in all respects.

For instance, at least some teachers will be motivated to accelerate digital applications because they see them as tools for furthering their own personal goals (e.g. amplifying

their worldwide reputation on the one hand, or improving their relationships with students).

And on the other hands, many students will be reluctant to embrace the new freedoms because they prefer highly structured curricula and course structures which give them certainty how much work and time and what precise activities and performances are needed to reach efficiently their educational goals. And they may even be less ready to forgo the many personal and social functions of local university enrollment and residential campus life: "latent functions" which stand out all the more clearly when the "manifest" functions (=teaching and learning) can be increasingly delegated to digitalized media and virtualized interaction.

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