# *A Pedagogical Model For Virtual Learning Space*

by Otto Peters

**ARTICLES** ON
FLEXIBLE **LEARNING** &
**DISTANCE**EDUCATION

# *A Pedagogical Model For Virtual Learning Space*

*By Dr. Otto Peters, Fernuniversität Hagen*

> *»The principle of the autonomy of learning is realised in learning spaces based on multimedia, because in them individuals can continue to learn still further of their own accord, without help and assistance from outside. They will arrive at a stage of self-determination from which they can control their own learning revolution. A fundamental task of future educational policies is to make this stage achievable for everyone«.* (Gottwald & Sprinkart 1998, 56)

An analysis of the special technological opportunities provided by a digital learning environment leads to the discovery that the wide and indeterminate learning space behind the screen of a computer can be subdivided for students into at least 10 different learning spaces (cf. Peters 1999). They enable educational activities thanks to the special technological situation, although some of these appear unusual, if not strange, to the traditional understanding of learning. The teaching and learning situations in these virtual spaces are structurally different from those in corresponding real spaces. To fill them with activities based on traditional education models are therefore inadequate, and in some areas would lead to confusion. The question also arises whether the new learning spaces can be recognised and understood in a technologically specific manner, and at the same time made useful for genuine educational purposes. The possible educational benefits of each one of the ten virtual learning spaces will be sketched and related to one another. Corresponding teaching and learning behaviour can be derived from this, which in some points deviates decisively from that experienced in real learning spaces. If these deviations are used together with the undisputed advantages of the digital learning environment, a new model of autonomous and self-controlled learning can be created which is oriented in accordance with the educational models of learning by »discovering« and »problem-solving«, and with the example of the independently researching academic. This type of model will in all probability be suitable and desirable for learning in the age of information.

## *Introduction*

In the attempts to use the technical unit consisting of the PC, multimedia and the Internet for teaching and learning there are often designs based on the user's own ideas, but processes and models from information and communication science, and also from computer technology, are also used. This is obvious, because most of these projects were developed by experts from these disciplines and because there is a certain proximity between information and teaching contents. At the same time, we must consider how the new technical media and processes can be used from the start for educational purposes and with educational methods, and starting from educational experiences. For example, the concepts, which are combined with teaching, and the learning model, which is held to be the correct one, are both very important. Even more important is the human image, which is integrated in the teaching and learning process. Are students perceived in their individual and social situation and as responsible persons in the learning process, or are they reduced to »users«? This question is fundamental for the use of the digital learning environment and must not be ignored. However, in the enthusiasm for the rapid technological advances in the field of information and computer science, educational aspects are often neglected by many protagonists of the digital learning environment. They think that a new era is opening up with the computer-mediated, network-based multimedia learning system, in which educational considerations can be left far behind. Because they allegedly point to the past, a pre-electronic era, and might get in the way of the emergence of a new age of teaching and learning.

In contrast to this, the primacy of education and even of pedagogy must be stressed. Even the most powerful digital learning environment equipped with the most up-to-date appliances remains an empty apparatus if all it is used for is to transport data or information. Both have to be converted into »knowledge«. Educational science can provide teachers and students with inestimable services here, to name just one important aspect.

## *Educational perspectives*

From the point of view of educational science the virtual learning spaces sketched here are each unusually attractive, because the specific activities which have become possible in them can be developed individually and separately, as well as combined, bundled and integrated.

The profit to be gained here in new possibilities for educational activities cannot be overestimated. Even if the digital learning environment had opened up just one of the sketched new learning spaces, e.g. the multimedia space, which enables different modes of presentation to be bundled, or just the information space with its rapid access to the databases in the World Wide Web. This in itself would have been a remarkable advance, which would have aroused the enthusiasm of the instructional designer and amazed the educational scientist. Instead, we have at least ten of these learning spaces each with its own specific learning activities which, taken together, structure the virtual learning space for the digital learning environment in an innovative manner. We are faced here with an innovation and modernising thrust of the first rank which is without example in the history of learning, and whose effects still can't be foreseen.
In daily use, because of the unique nature of these new learning opportunities and the possibility of the easy to mange combination, the digital learning environment proves to be an unprecedentedly versatile and extremely adaptable configuration of specific hardware and software. Thanks to its flexibility and adaptability it can be used for many educational services, not only to imitate traditional forms of instruction but also to design innovative learning architectures. The purposes for which it is used depend on many situational, institutional and economic factors, which of course also include the learning-theory orientation and the willingness to innovate of teacher and students.
Some of the particularly impressive educational chances of the new learning spaces will be sketched below in more detail. In doing this, the starting point will be the relevant educational activities, and the learning spaces enabled through technology will merely be referred to. In this way, the learning spaces, which can be used above all to innovate and modernise learning will once again become clear.

## *Expository teaching and receptive learning*

Traditional teaching and learning behaviour in accordance with the instruction paradigm (cf. Reinmann-Rothmeier & Mandl 1997, 359) is, as we have stated, transposed into the virtual space. Oral and written texts are brought to the monitor with the pronounced gestures of presentation, whereby this is based on the models provided by lectures, talks, papers, distance teaching courses, electronic courses, essays, mono-graph articles or entries in encyclopaedias (instruction space). This corresponds to the pronounced gesture of reception and absorption by the students, which is ex-pressed for example

in traditional lectures by busily taking notes, and in the digital learning environment by working through, copying and storing texts (storage space). In some of these virtual spaces the effectiveness not only of presentational teaching but also of absorptive learning behaviour can be increased. We should bear in the mind the cumulation, intensification and acceleration of presentation stimuli and modes (multimedia space) as well as the thoroughness, accuracy and clarity with which the presented teaching is processed and graphically designed (text processing space), and the speed with which it can be safely stored and accessed again and again for repeating teaching and learning (documentation space). Here the student's memory enters into an apparent symbiotic relationship with the computer's memory.
But there is even more. If we interpret such traditional learning as tending to be heteronomous, because most curricular and procedural decisions are taken by teachers, the digital learning environment appears to be able to perfect this traditional learning still further and to carry it to extremes. Presentations can be fixed step by step, and students »kept on a short lead« as it were (instruction space). The theoretical background for this form of teaching and learning is provided by David P. Ausubel in his »theory of expository learning and his concept of »practical receptive learning«.
An overlapping of expository teaching and receptive learning takes place if »programmed instruction« (computer-based learning) is offered in the digital learning environment. Students are led in very small steps from frame to frame, have to answer a test question on each frame and are provided with feedback on the success of their learning. Because these learning programmes were offered initially in printed form, and then through the computer, it appeared obvious to many to regard the digital learning environment as the ideal place for their presentations. In fact, there is something to be said for this, because programmes can be presented in a demanding and impressive manner (multimedia space), a tutorial-type dialogue is possible with the software (communications space) and branching off is easier to manage. However, this form of teaching and learning is in practice often educationally underdeveloped. In the past it was criticised for this very reason (cf. Bates. 1995). Often it is only useful for drill and practice. The versatile technological unit of the digital learning environment simply exercises the functions of presenting and page turning (presentation space).

Typically, the ambitious goal of programmers consists of using diagnostic tests, performance tests, information on results and selective repetition wit individual learning times to bring all (or nearly all) students to answer all the test questions, whereby the concept of mastery learning (Bloom 1968)

can be used as a guide. The domination of teachers in the procedure cannot be exceeded. Students are turned in a behaviourist manner into the objets of their teachers. The development of these programmes is based above all on varieties of instruction technology (cf. Romiszowski 1990, 165) and models of systematic instruction design (cf. Issing 1997, 201).

## *Learning by discovering and experiencing*

Another form of learning places students in the foreground, and not teachers. It believes that they are capable of planning, organising, controlling and evaluating their work themselves. Teachers exercise the functions of advisors, mentors and moderators. These are certainly not incidental or selective activities, but are task which have become even more demanding and important for autonomous learning in the digital learning environment than ever before. The digital learning environment provides unusually good preconditions for these special forms of »self-controlled learning« (Friedrich & Mandel 1997, 237) because it has learning spaces available, which enable, simplify and accelerate the appropriate activities.

### *Learning by exploration*

Work in hypertext represents a form of learning, which is located between heteronomous and autonomous learning and stretches into both forms. This makes it very flexible in its handling. It is clear that contents are set and presented by teachers, of-ten very artistically and at great expense with the collaboration of experts. If learning paths through the hypertext are then prescribed in the sense of guided tours, the external control of students is patently obvious.

At the same time, hypertext and hypermedia offer new learning spaces for self-controlled learning; the main reason for this is their non-linearity. The teaching text is not offered in the usual linear sequence, but consists of relatively self-contained information units, which are worked out, in the form of a network. The fundamental difference becomes clear if we consider the remark by Michael Joyce (1989, 221) stating that hypertext represents »thought in space rather than thought in time«. What is meant here is the space, which is built up in front of the students. Rainer Kuhlen (1991, 337) speaks in this context of networked »spaces«. In these spaces (hyperspace) students must »advance« and »explore«, to use terms taken from space exploration, if only to characterise the high level of activity which students must provide. They must decide themselves to explore the networked spaces of the hypertext, obtain an overview, gain and process impressions,

select the most suitable access for them, and finally discover and move along their own individual path through this special learning space (exploration space). A series of pedagogically and educationally desirable skills is developed and practised here.
Students profit here from an increase in autonomy because they can select the learning paths themselves on the basis of their own interests and associations, and at their own discretion and for their own strategy (exploration space). Ideally, each student takes his or her own personal learning path, which is not used by anyone else. This makes hypertext and hypermedia into an effective instrument for individualising learning paths and at the same time into a pre-school and school for autonomous learning.
This educationally completely new, and therefore for many people unusual, procedure, changes learning behaviour and even more teaching behaviour. Activity and a considerable amount of independence are demanded of the students. In addition, they must have a number of explorations techniques available, which have never before been described in educational science: navigating (moving from node to node without the path being fixed); browsing (wandering through the hypertext); searching (through selective queries to the database); connecting (making new links between defined information units); and collecting (innovative additions of information units to form larger units of knowledge)(cf. Haack 1997, 156). Robert Kleinschroth (1996, 178) also refers to flagging, in which information units or illustrations are marked for use later so that they can be found more easily; annotating, in which the student's own ideas are written onto electronic »notepaper«; and editing, in which selected texts, illustrations or sound documents are copied and added to a word processing program. This is an amazing innovation for those who are used to purposeful and presentational linear teaching. In addition there is the introduction and study of active and constructive and context-related learning. The opportunity to learn cognitive flexibility must also be stressed. These three quality features are at present derived from findings of cognitive psychology (cf. Tergan 1997, 129).

The disadvantages of such heavily stressed independence of learning in hypertext are seen above all if students lack experience and routine. They can then easily lose their bearings in this space or take on too much information at once (cognitive overload).
Teachers are also faced with unusual problems. The question for them is not to present defined contents articulately, and thus to teach, but to create special learning environments with the help of hypertext/hypermedia which

provoke self-initiated and self-controlled learning. To do this they will select complex and interdisciplinary content ranges and present them in a form, which enables quick access to each required set of facts and the individualisation of learning paths. Proximity to reality and the application of acquired knowledge are simulated with the help of hypermedia (multimedia space, simulation space).

In this way, a type of learning is constituted and practised in the exploration space in which pre-formulated knowledge is not learnt and the goal is not reached by means of given paths. Here the emphasis is on searching for, evaluating, structuring and arranging information, and associative, occasional and transversal learning is practised (Peters 1997, 220). It is not serial thinking, which is aimed for and practised, but multi-channel, structural, networked thinking. In this way, consequences from the research findings of constructivist psychology are drawn (Watzlawick 1994; Stangl 1985). The model, which most closely approaches this, is learning by doing, which was developed by Jean Piaget (1973 1954) and Jerome S. Bruner (1961). Resource-based learning and project-based learning are related forms of independent learning by exploration.

### *Learning by searching for information*

What are the activities, which can contribute in the digital learning environment to structuring the learning space, which is initially diffuse and unstructured? What must happen to discover which space is available for extracting and processing information, and how to move in this space? There are several possibilities for this. Students can check their hard disks and floppies to see if material, which has already been stored is suitable for helping them achieve their learning goals. They can find out whether electronic journals, books, dictionaries and libraries can contribute anything to the subject. They can look through the electronic list of books in print, gain access to databases and suitable search engines, check in a mailing list or newsgroup, put questions to an expert via e-mail and request digital teaching programmes and search them for relevant information (information space, communication space).

Sceptics may argue that searching for literature is not particularly innovative because it is a fixed component of traditional methods of studying. In principle, this may be correct, but the great differences are overlooked. The digital information space is so extensive, wide and deep, and so multi-facetted, in ways in which the most intensive research in a library cannot be. It is

international, which is imperative at present in many disciplines, and is becoming more important in others. And it is accessible day and night. Users do not have to travel distances or use transport. And the information is obtained amazingly quickly, provided the technology does not break down. Basically, all the information we require is »at the tips of our fingers«.

We should not underestimate these activities and think that they only play a role as preparation for working through a subject. In reality, they accompany the work afterwards and finally become an integral part of autonomous learning, and indeed of academic studies. Certain attitudes, strategies and working methods are required which must be acquired as a type of research propaedeutics. Constant precursory and exploratory sorting of large volumes of information must become second nature to students. In fact, these activities may themselves be interpreted as a learning process. Firstly, information which students have searched for, and information they have not searched for directly (serendipity effect) is absorbed and assimilated, and, secondly, the comparative evaluation of this information with regard to the students' own learning intentions, their calculated selection and strategic application is itself a demanding cognitive process. The point here is to bring the neutral information into the students' own work and learning context, and at the same time to arrange it in the given social and location/time context, so that the information can only now be converted into knowledge. Cognition must therefore always be accompanied by metacognition, in which, among other things, the preference, priorities and selection criteria must be brought into equilibrium (cf. Döring 1997).

If we take the researcher working independently as the model to be aimed at for the development of autonomous learning, the great significance of the ability to move around the information room becomes immediately clear.

### *Learning by communication*

Talks, discussions, discourses and the written exchange of information as such are of course not innovations. They are in fact traditional components of many forms of academic and scholastic learning and teaching. However they are increasingly pushed to one side here by the dominance of presentational teaching, spoken and written, whereas in the digital learning environment in the communication space several interesting chances for realisation offer themselves which are available quickly and without great

expense. In contrast to traditional learning locations, with the help of networking, links to communication partners, from a technical point of view, are provided everywhere and at all times. Working in the net becomes an important learning activity. The following forms have developed: electronic mail, electronic noticeboards, newslists, computer conferences and Multi User Domains. With additional devices audio conferences, audiographical conferences and videoconferences can be offered parallel, as can be seen, for example, in the Canadian Project North (cf. Peters 1997, 301).

Electronic post (e-mail) can be used to send text simply and in seconds to other students, teachers and others in the learning-teaching process. Normally, »messages« is exchanged between two or more persons. In this way, written »talks« or »discussions« and the ever-popular »chatting« (which can also take place in specially set up chatrooms or cafeterias) materialise which can become the focuses for social integration. These are new forms of communication, which carry out very different educational functions in different virtual spaces.

- The electronic noticeboard (bulletin board, news group) is a freely accessible discussion forum. All users can publish their information here, or question, comment on or criticise other information published here. Students can also request and download the discussion contributions and articles posted here and process them in the context of their learning process. This special form of communication should not be regarded as being casual or even trivial. Students who have specialised in a certain area can exchange information here with students of the same subjects in other universities. Specialists have already formed knowledge-building communities with this facility, even in research. The electronic noticeboard is becoming a »main source of professional growth« (Collis 1996, 67).
- Computer conferences provide a framework for longer and more in-depth discussions on defined aspects of the learning object. Participants can ask for the floor at any time and make a contribution, comment on other contributions, or make a contribution based on their own experiences. These discussions are particularly interesting, but also difficult if members of the seminar group argue from the basis of different cultural contexts (cf. Bernal & Rubin 1999).
- With all these forms of academic communication, and this is obvious, students re-main invisible because of the unique nature of the virtual learning space. Their learning behaviour is expressed only in the methods of their written participation. For this reason they have to be intro-

duced with the help of photos and biographical sketches so that all participants can see what the others look like. In this way a structure is provided for the initially diffuse learning space. Two introduction levels are created: firstly, communication takes place with people who become clearer and clearer, whether they are in Kobe, Melbourne, Manila, Dubrovnik, Oldenburg, Vancouver or Mexico City; and secondly, the influence of the metaphor »seminar« leads to participants imagining themselves together in one room, and their asynchronous contributions are converted into synchronous contributions, whereby, in the same way as in a face-to-face seminar, participants think they can differentiate between others who are particularly dominating, eager, reflective, careful, timid, self-conscious and silent.

- At the same time, the virtual learning space is structured by means of specific social arrangements. In face-to-face teaching, the social structure of the learning group is traditionally relatively stable, thanks to the link between place and time, and to difficulties in changing it, but in learning in the Internet it can be changed easily and frequently. Consequently, several constellations are possible in the virtual learning space which Morten Flate Paulsen (1997, 121) has arranged and designated as follows:
- One person communicates with another person (paradigm: e-mail)
- One person communicates with several others (paradigm: noticeboard)
- Several persons communicate with several persons (paradigm: virtual conference.
- The decisive question which the educationalist has to pose here is, how do learning processes develop if communicative actions of the type shown here are available easily and at short notice, consecutively and simultaneously, and in quick succession. This gives rise to other questions. Which learning functions are compatible with the three social configurations and their corresponding learning activities? Will teachers and students be able to handle these three forms of communication confidently? Will orientation models have to be provided? Work on these research questions could lead the way to an educational theory of communicative action in the virtual learning space.
- All the forms shown here have the aim of giving students in the digital learning environment the feeling that they are not alone (although normally they are in fact alone). They should be able to assure themselves from time to time that they in fact »linked« to other students and to tutors and teachers. »Connectivity« has be-come a key educational term in this context.

- The innovations discussed here go far beyond the forms of communication in traditional studying. Their importance for the educational structure of digitally enabled learning must be seen as very great.

### *Learning through collaboration*

- The term »collaboration« is not found in the specialist language in Germany. In English it is understood as working together in particular in »writing and study« (Webster 1953, 524). What this means in Germany is traditionally dealt with in connection with group education and group instruction. Here the social relationships of the members of the group are made into the medium for educational and didactical processes, which naturally includes collaboration. From the aspect of pedagogy, aims are followed such as the individual development and maturity of the participants, their social integration, social responsibility, self-realisation through interaction in a relatively control-free space, as well as helping them to cope with their existence. Seen didactically, an effort is made to use the advantages of group work and mutual help in learning, e.g. in solving problems and imparting values and standards. Often, group instruction is emphasised and supported, to modify block instruction (in classes), lectures and individual work (self-studies). Partner work and learning in small groups and in project groups have taken shape most strongly.
- In the digital learning environment processes that serve these aims are termed collectively »collaborative learning« (collaboration space). This is understood in general as »individual learning occurring as a result of group processes« (Kaye 1992, 2), as in traditional didactics. Naturally, what takes place here is virtual collaboration, which is why it has been described paradoxically as »learning together apart« (Kaye 1992, 1). In the context of this representation, the opening up of new working and learning spaces is important, for working with a partner, for working in small groups, but also in extremely large groups, which enables completely new social forms of learning (e.g. IBM's in-house system).
- In the central point of collaborative learning are computer conferences, and the following forms of collaboration have developed using them as a foundation: the virtual seminar, the on-line classroom, on-line games and simulations, and of course joint learning and working projects such as, for example, »knowledge building communities«. Partner work should also be mentioned here, which may also be a question of the spontaneous solution of special problems, but also of jointly planning and resolving to take a course.

### *Learning through storing and information management*

Learning was originally learning by heart. It consisted basically of receiving, retaining and memorising the contents, which had to be learnt. The point here was to »store« knowledge and experience in the memory and to develop a special skill in accessing and reproducing what had been learnt at the right time. This must be said to counter the opinion that storing and recalling information are merely technical processes, and to indicate just how strongly they are linked with learning itself. The close relationship with one another of the two elements was greatly changed by writing and printing. For five hundred years, learning, and scientific work, was based on the interplay of the memory with external stores of knowledge made possible by technical means. The load on the memory was relieved, and this created a free space for other cognitive operations. In the digital era, this change has intensified both qualitatively and quantitatively to an extent which is difficult to conceive, because information and knowledge can be stored on hard disks, diskettes and on CD-ROM without any effort and in seconds, and recalled from there. The volume of the external memories is in addition extended drastically through the development of special databases, which can be accessed from a distance and used for educational purposes.

These circumstances place students in a digital learning environment in a new situation. They must internalise the greatly changed weighting of the internal knowledge store and external knowledge stores, and make the best use of them for their learning processes. It is important here to develop and optimise specific strategies and routines for these learning activities. The reason for this is that »education increasingly means a symbiosis of biological and artificial memories« (Tiffin & Rajasingham 1995, 43).

If the interplay of the human memory with an external information store has been achieved, during learning students can store selected information at the flick of a wrist for practising, learning, retaining and applying, and recall the information at any time in seconds. They have no problems in compiling a personal file related to the learning object and in extending it continuously. The work of academics with their files, the way they handle information they regard as important, searching and finding, remembering and checking, comparing and relating, becomes more significant and is integrated into the learning process. In this way, activating learning techniques are practised which are not found in this way, and certainly not as manageable, in traditional face-to-face teaching and in first-generation distance education. Storing can be developed further into proper information and management.

The advantages of knitting together a research and learning technique, and its importance for the development of autonomous learning, must be emphasised here.

### *Learning through representing and simulating*

In traditional teaching and learning what has been learnt is usually repeated orally or in writing, in papers, examination work, notes, essays, reports and articles. Learning effects result which are often created when students write out something they have learnt, reformulate a problem, give new reasons for a solution they have already found and discuss them, or illustrate complex findings for others. From the point of view of didactics, these may be repetition, training or application activities. At the same time, representing what has been learnt can also lead to creative ideas, to turning an existing solution into a problem or to metacognitive considerations.

In the digital learning environment, these didactic activities correspond to the efforts made to reformulate what has been learnt for the students themselves and for others, and to present it, in this case with the means presented by word processing systems, including special graphics and presentation programmes and multimedia (presentation space, word processing space, multimedia space). This gives rise to many new opportunities. The multimodality of multimedia should be emphasised in particular, which is seen by Paul Klimsa (1997, 8) as the absorption of information via several sensory channels and the parallelism and interactivity which is possible at the same time.
For students learning autonomously, this leads to an increase in the importance of the didactic effects referred to for conventional learning. We should pay attention to them in the digital learning environment as well. At the same time their didactic function changes. We should no longer regard the presentation of what has been learnt simply as the conclusion of learning processes, but as an integral component. Nicola Döring (1997, 324) has provided some apposite examples. Where the question is to grasp and understand a problem, the presentation of the »explicit knowledge structure« can be very helpful which »appears plausible to us and is understood and accepted by others«. When solving problems, »an organisation and reorganisation of available information representations in interplay with the reorganisation of our own cognitive constructs« should be aimed for. When students want to visualise or simulate, they are forced to become clear about their own thoughts with regard to the object which is to be represented, and to work it out in the form of a model and in detail. These

representations not only support learning and lead to new knowledge, they can also demonstrate the learning success, which has been achieved, and this can have an effect on the learning motivation.

If the product is a paper, an article, a Web Site, a posting or even a message, what is represented achieves particular importance in the digital learning environment, in that it can be received and if necessary processed by a partner, several members of a learning group, or indeed from anyone. The chances of not simply working for something, which will be put into a drawer, are therefore increased. Representing what we have learnt becomes an instrument of communication and cooperation. The success of jointly researching learning in a knowledge building community (Scardemelia & Bereiter 1992) is only possible if all members inform the others of what they have thought and worked out, so that the »common knowledge« of these groups can be held in a central database to be used at any time.

Accordingly, students learning autonomously must be thought of as people who always think about presenting what they have learnt, train themselves in this and acquire particular skills by entering texts, composing them, design convincing graphics for them, develop diagrams and design simulations. They do simply absorb information, relatively passively, but work with it and present the results of their work. They do this with all the technical facilities provided by the digital learning environment. PowerPoint represents only one dimension of their multitudinous possibilities. Numbers are converted into coloured diagrams, complex sets of facts shown in the form of three-dimensional networks and surface diagrams, animated mathematical models are developed to simulate processes.

However, the danger of the easy visualisation of facts and learning results is always seen if it does not in the first place serve to achieve educational goals but becomes an end in itself. The question must always be put here whether the selected presentation has an educational »added value« (Kuhlen 1991, 212).
In spite of the innovative nature of the forms and functions of representations of acquired knowledge, there is still no lack of previously relevant didactic endeavours. Structural communication (Hodgson 1974, Egan 1976) must be mentioned here. This is a cognitive approach to self-instruction (Romiszowski 1986, 181), and is based on findings of cognitive psychology and field theory.

## *Interpretation*

All the learning types shown as examples here have strongly innovative tendencies. They change conventional teaching and learning and adapt it to the requirements and circumstances of the post-industrial information society. Whether some of these learning types are practised separately, or whether procedures can be constructed in which several, or all, of them are found together, must be decided on the basis of the respective learning situation and with regard to given curricular links. The educational gains, which are possible here, can be seen today: learning is more flexible, variable, adaptable, available and more easily accessible. According to Heinz Mandl, Hans Gruber and Alexander Renkl (1997, 439) it is also gaining more »closeness to reality«, »problem orientation«, »learner activity« an »adaptive instructional support«. Impulses emerge from what happens or can happen in the new learning spaces, which restructure teaching and learning. In this context, there are indications that a new educational epoch is in the offing. If modern learning can be described as linear, causal, logical, hierarchical, systematic, concentrated, located and with a closed curriculum, in virtual spaces it is developed in essentials in a manner which in contrast can be regarded as post-modern. It is non-linear, non-causal and not constructed logically, but is associative, random decentralised, fluid and opaque, dislocated and distributive, and the curriculum is open.

If we attempt to image the educational structure of learning in the new spaces, the following dimensions of the change in particular spring to mind:

- Method: teaching and learning are no longer focussed on the group but on individual work.
- Didactics: the function of learning itself is changing: in the industrial society knowledge and skills were essentially stockpiled for future vocational and private use, but in the post-industrial information society learning on demand (Schönwald 1998, 6) is establishing itself more and more, and this may lead to greater integration in these two areas. It is in fact the new learning spaces, which enable and facilitate this.
- Logistics: as a result of doing away with distances and time, the media and the methods derived from them are enormously consolidated.
- Institutions: as a result of the establishment of distributive learning the impact of universities and schools is weakened. Important »processes of dismantling borders and destructuring« (Kade 1989) are taking place.

# *Consequences*

## *Altered teaching and learning behaviour*

The greatest innovation effect can be verified if we analyse the extent to which teaching and learning behaviour is changing in the new learning spaces.
We will soon have to use a different image for students. According to Franz-Theo Gottwald and K. Peter Sprinkart (1998, 59), students must possess five skills to be able to study in virtual learning environments, namely, self-determination and orientation, selection and decision-making, instrumental-qualificatory acquisition, construction-qualificatory acquisition and learning and organising skills (cf. Lange & Hillebrand 1996).

This means that students must be ready for, and capable of recognising, actual learning goals and learning possibilities on the basis of changes to their lives and work, be willing to plan and organise their learning independently and to absorb and organise it largely independently of teachers. In the face of the indeterminable abundance and variety of the information which is now available in all accessible data-bases, the capability of searching for, finding and evaluating information which is important for a student's own learning will be difficult and unusual. The most difficult task will probably be to assess contents and offers of support with regard to the planned learning processes, because this presupposes metacognitive experience and considerable didactic insight. Finally, students must be able to handle the technical equipment of the digital learning environment routinely and creatively. All this must be supported by an approach, which is observant, attentive, calculating, navigating, exploring, communicative and collaborative.

Critics will argue that these five qualifications are basically nothing new, because they are required in traditional university teaching. This also requires self-determined learning activities (e.g. seminar work, papers, etc.), information is looked for and found (e.g. researching bibliographies), selections must be made from the abundance of the complete teaching range, decisions are taken (e.g. for and against seminars, lectures, learning modules or teachers, etc.), handling media must be learnt (e.g. books, audio and video recorders), the learning path through to the examinations must be carefully and strategically planned, and specific learning techniques must be acquired and trained.

This is of course correct. But all these activities, and this is overlooked, are only rudimentary here. They are much more important for learning in virtual space, because students have taken over most of the functions of teachers. This creates a structurally different learning behaviour. For students learning independently, who are also responsible for their own learning, the five skills referred to above are seen in completely different light, because they must be emphasised to a much greater extent. In this respect as well, students learning autonomously are an important result of the digitalising of learning.
Teachers are also affected by the far-reaching structural changes. Teaching behaviour is determined by a displacement of the centre of gravity - away from presentation and towards counselling and tutorial support for students learning autonomously - and by the development of non-linear learning systems in which, on the one hand, the complexity of academic learning is expressed, and, on the other, learning by exploring and discovering is enabled and supported.

## *New categorial accents*

The extent to which learning in virtual learning spaces has altered can also be seen from a theoretical aspect. The change in the weighting of some didactical principles as against traditional learning springs to mind. Some examples are discussed below.
The multimedia and multimodal nature (i.e. the reception of information through several sensory channels) is continuously emphasised as a characteristic innovation. The activation of the students is given a higher rank, above all not only with work with hypertexts but also with learning by discovering. The quantitatively and qualitatively improved interactivity of students plays a much greater role than in traditional learning, and is shown by the protagonists of digital learning environments to be the greatest advantage (cf. above all Haack 1997). Basically, however, it is not a didactical goal in itself, at most in the sense of formal education, but a means to achieve defined learning goals, which are to be used to define its type and duration.
The adaptability of teaching programmes to the individual requirements of students and to changes in society can be very marked, e.g. in hypertexts and with autonomous learning. The connectivity is specific to work in a digital learning environment because it is based on the links to other teachers and students which are easy to establish and which rapidly bridge space and time. It is a counterweight to the isolation of students in the digital lear-

ning environment. This is a completely new category for didactics. The individualisation of learning provides new and increased chances. Communication and collaboration are easier to establish and to realise than in traditional teaching and in this way they enter the foreground of didactic considerations. Above all, the model of the autonomous student no longer remains an illusion but now has much better chances of being realised.

In contrast, asynchronicity, which is often put forward as a characteristic of learning in the field of multimedia (cf. Issing & Klimsa 1997, 1) does not deserve the attention it is given because it is not specific to this type of learning alone. Since writing and printing came into use, learning has been asynchronous. This category plays an increasingly greater role in preparing »homework« and in all systems for distance teaching and distance education.

In general, the invasion and take-over of many new technological terms from the fields of computer and communications science forces us to interpret them didactically and to link or fill them with didactical categories. This leads to focal points being displaced. Previously unused didactic models will probably play a part here, e.g. cognitive apprenticeship, communities of practice, reciprocal teaching, and knowledge building communities (cf. Schulmeister 1997, 78).

## *Loss of didactic substance*

- The fact that the important chances for a structural renovation and modernisation of teaching and learning are also faced with considerable didactically and educationally relevant losses should not be concealed. These are above all the following deficiencies:
- The specific effects of real teaching spaces are lost. For this reason, positive, negative or neutral feelings for them are not developed. We cannot »feel at home« in them, or get used to them. A »feeling« or »consciousness« of space, or even a feeling of »belonging« and »security« cannot develop. The learning space does not become a »stage« for the success or failure or didactic activities. The »abundance of significant events experienced in it« (Dürckheim) cannot be perceived. The memory of acquired knowledge is no longer, as with previous generations, linked to particular persons, in particular buildings and at particular locations.
- The interdependence of all »simultaneous« facts in the learning field (Lewin), the »factor complexion in the pedagogical field« (Winnefeld),

and the »dynamic processes of interaction of strict reciprocal dependence« in the »didactic reference field« (Heimann) are divided by the relationship to one another of real learning locations and virtual spaces, checked, weakened by asynchronicity. In particular, the historical dimension is practically completely missing in the way in which it had an effect in traditional teaching and learning.

- Because there is no real learning space, there are no physically real fellow students and teachers. This reduces the whole field of non-verbal communication, contact with people made of flesh and blood who are pursuing the same goals, as well as the dynamism of learning in groups and, as a result, a considerable part of the socialisation effects achieved through direct personal contact. Students in the digital learning environment must work separately and in isolation. Does anyone really believe that this loss can be compensated for by virtual communication and virtual learning groups? Is it »really reasonable to assume that we can breathe new life into the idea of community by sitting alone in our rooms, entering messages into our networked computers and filling out lives with virtual friends?« (Turkle 1998, 382).
- If repeated virtual social contacts do take place, my experience is that they are strangely sterile and artificial. This is above all the case with computer conferencing, but also with synchronous interaction with sound and pictures. The communication lacks spontaneity and depth. It is susceptible to interference. The flow of subjective feeling is diluted and interrupted. All this can in fact be the case even if the participants allegedly like and approve of this form of communication.
- Teaching and learning is no longer »experienced« globally as a unit consisting of space, time and ritualised social interaction. This is why learning experience cannot be »localised« and floats, so to speak, in the indeterminate. The spatial and temporal contextualisation, which is so important for learning, is lost. The much-quoted expression »lost in hyperspace« (e.g. Klimsa 1997, 15; Tergan 1997, 133; Haack 1997, 155) refers to this.
- The original and the authentic are not experienced. People, objects, and often situations, are simply copies which can be repeated often. With their help we can only construct a secondary, derived teaching and learning reality. The »aura« is lost, as with technical reproductions of works of art.

These are serious losses. They reduce, surround, parcel out, spoil or destroy experiences gained at school or university. For this reason, it may be concluded, learning in virtual space will never be able to replace completely tea-

ching in real spaces. Systems of teaching and learning will have to be designed in which the two methods complement and involve each other. To do this however, the forms of teaching and learning in real spaces will be forced to change in the sense of increased direct and personal communication and collaboration with reduced presentations of contents. In particular, emphasis will have to be placed on maintaining »social contacts« (Casper 1996, 25).
Losses of this nature are regretted by most people, in particular by those who are still more or less rooted in the bourgeois culture of our industrial age. However, we are at a turning point: the world is going digital. People in the coming information era will differ from those in the industrial era in the same way that the latter differed from those in the agricultural era. Paradigm changes, changes in values and completely new experiences become new insights, attitudes and habits. Essential activities will in any case take place increasingly in virtual space, including learning in education and continuing education. Such people will probably regard these losses in a manner different to ours.

## *Gains of pedagogical substance*

When students grow up in the digital world, a new world will be opened up to tem in learning, playing, working and dealing with many other, often unknown, persons, as Sherry Turkle (1998) has described so convincingly. They will live and learn alternately in real and virtual spaces. Both will have different effects on the formation, alteration and protection of their identity. Virtual spaces in fact offer possibilities, which are not found in real spaces. According to Winfried Marotzki (1998), we will be faced with phenomena such as »disinhibition«, gender swapping, the development of multiple identities, and with an experimental »construction and reconstruction of the self«. Previously unexplored dimensions of the development of the person will open up. What the significance of these completely phenomena for cultural history may be is seen in Marotzki's assessment according to which the image of the »patch-work of one’s own identity« which is occasionally used in the post-modern discourse has become »virtual reality« in the new spaces. There is no doubt that we are dealing here with important aspects of the new learning spaces.

Judged generally, the attempts taking place at present all over the world to gain experience in the new virtual learning spaces might be seen as a contribution to the preparation for coping with life in the global technical civil-

isation of the information age. This would indeed be a genuine extremely valuable pedagogical gain to be place against the loss of didactical substance.

## *Evaluation*

Although the process of digitilisation of didactic action has new been taking place for some years, seen from the whole aspect of the development of didactics we must speak of a breach in the traditional practice of teaching and learning. What has happened in a short period here is amazing, particularly if we consider how slow, protracted and laborious comparatively minor reforms of teaching and learning were in the past.
Everything here has happened very quickly, because advances in information and communication technology have come hot on each other's heels, and were not only taken over in education, in particular in continuing vocational training, but also in politics, culture, society and work, all over the world. There has never been a breach of this size in the history of teaching and learning, not even after the discovery and use of writing, printing or the audio-visual media radio, film and television.
The change from real learning spaces to virtual learning spaces has caused this breach. It was not foreseen, let alone desired or aimed for, by any educationalist. Teachers and students are exposed by it to a situation which has a completely different structure and which offers a variety of new opportunities. We in continuing education must also adapt to this situation, a process which will take years, if not decades, and which we may be unable to bring to an end.
The existence alone of virtual learning spaces should not by itself be regarded as an innovation or reform of teaching and learning, no matter how abundantly equipped with the technical appliances with whose help they can be constructed. Only when they have been educationally opened up, each one for itself and linked to others, will we find ourselves on the road to innovation and reform. This will need the initiative, intelligence, imagination and creativity of all participants, teachers and students, instructional designers, as well as educational and learning psychology researchers.
Many people regard the increased use of virtual learning spaces as a »Copernican turning-point« (e.g. Kleinschroth 1996, 8), others as a revolutionary development (e.g. Perelman 1992, 24). I regard it as the most fundamental didactical event of the present, and one, which is of great cultural and historical significance

## *References*


- Ausubel, D. P. (1968): The Psychology of Meaningful Verbal Learning. New York (Grune & Stratton).
- Ausubel, D. P. (1980): Psychologie des Unterrichts, Band 1, S. 148, Band 2, S. 90. Weinheim (Beltz).
- Bates, A. W. (1995): Technology, Open Learning and Distance Education. London (Routledge).
- Bernath, U. & Rubin, E (eds.) 1999 Final Report and Documentation of the Virtual Seminar for Professional Development in Distance Education. Oldenburg: Bibliotheks- und Informationssystem der Universität Oldenburg
- Bernath, U. & Rubin, E. 1998 AVirtual Seminar for International Professional Development in distance Education. In Informatik Forum, vol 12, No 1 (March)
- Bloom, B. S. (1968): Learning for mastery. In: Valuation Comment 1, S. 2. University College of Los Angeles (UCLA).
- Bruner, J.S. (1961): The act of discovery. In: Harvard Educational Review, 31, S. 21-32.
- Casper, G. (1996): Eine Welt ohne Universitäten? Werner Heisenberg Vorlesung. Bayerische Akademie der Wissenschaften und Carl Friedrich von Siemens Stiftung. München, 3. Juli 1996. Zitiert nach einem Sendemanuskript der Tele-Akademie des Südwestfunks vom 26. 1. 1997.
- Collis, B. (1996): Tele-Learning in a Digital World. London (International Thomson Computer Press).
- Döring, N. (1997): Lernen mit dem Internet. In: Issing, L. J /Klimsa, P. (Hrsg.) Information und Lernen mit Multimedia. Weinheim ( Beltz). S. 305-336.
- Dürckheim, Graf K. (1932): Untersuchungen zum gelebten Raum. In: Neue psychologische Studien, Band 6, München. S. 383.
- Egan, K. (1976): Structural Communication. Belmont, California (Fearon Publishers).
- Erlach, Ch., Reinmann, G. und Mandl, H. (1999) Wissensmanagement in der Weiterbildung. Ludwig-Maximilians-Universität Münschen, Institut für Pädagogische Psychologie und Empirische Pädagogik. Praxisbericht Nr. 13.
- Friedrich, H.F. & Mandl, H. (1997): Analyse und Förderung des selbstgesteuerten Lernens. In: Weinert, F. E /Mandl, H. (Hrsg.): Psychologie der Weiterbildung. (En-zyklopädie der Psychologie, Serien I, Band 4). S. 237-293.

- Gottwald, F.-T. & Sprinkart, K. P. (1998): Multi-Media Campus. Die Zukunft der Bildung. Düsseldorf (Metropolitan Verlag).
- Haack, J. (1997): Interaktivität als Kennzeichen von Multimedia und Hypermedia. In: Issing, L. J /Klimsa, P. (Hrsg.) Information und Lernen mit Multimedia. Weinheim (Beltz). S. 151-166.
- Heimann, P. (1962): Didaktik als Theorie und Lehre. In: Reich, K. /Thomas, H. (Hrsg.): Paul Heimann: Didaktik als Unterrichtswissenschaft. Stuttgart (Klett). S. 142-168.
- Hogdson, A. M. (1974/75): Structural communication in practice. In: Romiszowski, A. M. (ed.): APLET Yearbook of Educational and Instructional Technology (1974/75). London (Kogan Page).
- Issing, L. J. & Klimsa, P. (Hrsg.) (1997): Information und Lernen mit Multimedia. Weinheim ( Beltz).
- Issing, L. J. (1997): Instruktionsdesign für Multimedia. In: Issing, L. J. /Klimsa, P. (Hrsg.): Information und Lernen mit Multimedia. Weinheim (Beltz). S. 195-220.
- Joyce, M. (1989): Interview. Discover. In: The World of Science, November 1989. Mitgeteilt von R. Kuhlen (1991).
- Kade, J. (1989): Universalisierung und Individualisierung der Erwachsenenbildung. In: Zeitschrift für Pädagogik 35, 6. S. 789-808.
- Kaye, A. R. (1992): Learning Together Apart. In: Kaye, A. R. (ed.): Collaborative Learning through Computer Conferencing. NATO ASI Series. Berlin (Springer).
- Keegan, D. (1995) Distance Education Technology for the New Millennium: Compressed Video Teaching. ZIFF-Papiere 101, Hagen (Fernuniversität-Gesamthochschule, Zentrales Institut für Fernstudienforschung).
- Kleinschroth, R. (1996): Neues Lernen mit dem Computer. Reinbek (Rowohlt).
- Klimsa, P. (1997): Multimedia aus psychologischer und didaktischer Sicht. In: Issing, L. J. /Klimsa, P. (Hrsg.): Information und Lernen mit Multimedia. Weinheim (Beltz), S. 7-24.
- Kuhlen, R. (1991): Hypertext. Ein nichtlineares Medium zwischen Buch und Wissensbank. Berlin (Springer-Verlag).
- Lange, B.-P. & Hillebrand, A. (1996): Medienkompetenz: die neue Herausforderung der Informationsgesellschaft. In: Spektrum der Wissenschaft, Heft 8. S. 38.
- Lewin, K. (1982) Feldtheorie des Lernens. In:Graumann, F. C. (Hrsg.): Kurt-Lewin-Werkausgabe, Band 4, 154. Bern (Huber).

- Mandl, H., Gruber, H. /Renkl, A. (1997): Lernen und Lehren mit dem Computer. In: Weinert, F. E. /Mandl, H. (Hrsg.): Enzyklopädie der Psychologie, Band 4: Psychologie der Erwachsenenbildung. S. 437-467.
- Marotzki, W. (1998): Virtuelle Realität, ubiquäres Wissen. – Eine bildungstheore-tische Herausforderung. Arbeitspapier. Magdeburg: Otto-von-Guericke-Universität, Lehrstuhl Allgemeine Pädagogik.
- Paulsen, M. F. (1997): Teaching methods and techniques for computer mediated communication. In: The 18th ICDE World Conference: The New Learning Environment. A Global Perspective. International Council for Distance Education. The Pennsylvania State University. Abstracts. S. 120.
- Perelman, L. J. (1992): School's out. A Radical New Formula for the Revitalization of America's Educational System. New York (Avon Books).
- Peters, O. (1997): Didaktik des Fernstudiums. Erfahrungen und Diskussionsstand in nationaler und internationaler Sicht. Neuwied (Luchterhand).
- Peters, O. (1999): Neue Lernräume. In: Grundlagen der Weiterbildung: Praxishilfen, Kapitel 5. Neuwied (Luchterhand).
- Piaget, J. (1954): The construction of reality in the child. New York (Basic Books).
- Piaget, J. (1973): Einführung in die genetische Erkenntnistheorie. Frankfurt am Main (Suhrkamp).
- Reinmann-Rothmeier, G. /Mandl, H. (1997): Auffassungen vom Lehren und Lernen, Prinzipien und Methoden. In: Weinert, F. E. /Mandl, H. (Hrsg.): Enzyklopädie der Psychologie, Band 4: Psychologie der Erwachsenenbildung. S. 355 - 403.
- Romiszowski, A. J. (1986): Developing Auto-Instructional Materials. London (Kogan Page).
- Romiszowski, A. J. (1990): Designing Instructional Systems. London (Kogan Page).
- Scardemalia, M. /Bereiter, C. (1992): An architecture for collaborative knowledge building. In: DeCorte, E., Linn, M. C., Mandl, H. /Verschaffel, L.: Computer-Based Learning Environments and Problem Solving. Berlin (Springer). S. 41-66.
- Schönwald, O. (1999): Modernes Lernen mit Multimedia und Internet. In: Hagener Universitätsreden 25. Hagen (Fernuniversität Gesamthochschule). S. 51-74.
- Schulmeister, R. (1997): Grundlagen hypermedialer Lernsysteme. München (Oldenbourg).
- Stangl, W. (1985): Das neue Paradigma der Psychologie. Die Psychologie im Diskurs des Radikalten Strukturalismus. Braunschweig (Vieweg).

- Tergan, O.-S. (1997): Hypertext und Hypermedia: Konzeptionen, Lernmöglichkeiten, Lernprobleme. In: Issing, M. J. /Klimsa, P. (Hrsg.): Information und Lernen mit Multimedia. Weinheim (Beltz). S. 123-138.
- Tiffin, J. & Rajasingham, L. (1995): In Search of the Virtual Class. London (Routledge).
- Turkle, Sh. (1998): Leben im Netz (»Life on the Screen«). Reinbeck (Rowohlt).
- Watzlawick, P. (Hrsg.) (1994): Die erfundene Wirklichkeit. Wie wissen wir, was wir zu wissen glauben? Beiträge zum Konstruktivismus. München (Pieper).
- Webster, N. (1953): The New International Dictionary of the English Language. Springfield, Mass. (Merriam).
- Winnefeld, F. (1971): Pädagogischer Kontakt und Pädagogisches Feld. Beiträge zur Pädagogischen Psychologie. München (Reinhardt).

With these working-papers **tbc-Consult** and **DEL** hope to help to develop a better understanding of the profound changes that are taking place in learning today. The old and traditional ways of learning have become irrelevant in methods and also in purposes. We therefore have to create new ways of learning for a changing world. We hope that these papers will help with experience and inspiration.

Jens-Jørgen Pedersen (tbc-Consult)
& Niels Henrik Helms (DEL)

Susanne Tellerup (DEL) edited the papers and TeR Døssing (Dd•sign) did the Layout.
The papers were produced for Conferences on Open and Distance Learning *[www.fju.dk]*.

fju.

**Sponsors & participants:**

**SPONSORS** • uvm [www.uvm.dk] • aciu [www.aciu.dk] • ctu [www.ctu.dk] • ams [www.ams.dk] • eu [www.socialfonden.dk] • **CONSULTANTS** • del [www.delud.dk] • tbc-consult [www.tbc.dk] • itai [www.itai.dk] • **PARTICIPANTS** • handelsskolen i randers [www.hsrds.dk] • amu horsens/silkeborg [www.amuhs.dk] • kolding tekniske skole [www.koldingts.dk] • euc-syd [www.euc-syd.dk] • aabenraa business college [www.abc.dk]