THE VIRTUAL COMPANY: TOWARDS A SELF-DIRECTED, COMPETENCE-BASED LEARNING ENVIRONMENT

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Summary

This paper discusses the concept of a Virtual Company in education. The Virtual Company is a collaborative distributed learning environment built upon the notions of both compentence-based learning, collaborative learning, constructivist learning, open learning and distant education. It features an open, authentic role playing game which is strongly modelled upon the functional structures of real life companies. It claims to overcome the traditional demarcation between learning and working, to enhance the quality and effectiveness of learning processes and to address the educational demands and needs of society. In this article the set-up of the Virtual Company is outlined in conjunction with underlying educational design principles.

Introduction

Over the years it has been the educational system's main objective to provide the labour-market with a steady supply of adolescents adequately equipped with knowledge and skills to be successful on that market. Some decades ago it became clear that an everlasting flow of technological innovations was giving rise to profound and continuously changing demands upon employees. Therefore, it was realised that the acquisition of knowledge and skills cannot be restricted to the phase of initial education; rather, it had to be a process continuing throughout one's entire working life. In addition, it became evident that the classical ideals of erudition and scholarship with their emphasis on knowledge of facts, had better be replaced by an educational system that supports the acquisition of competencies.

Unfortunately, the educational institutions seem unable to keep up with these rapidly changing needs and demands of society. Although a large number of innovative initiatives can be observed – including a variety of media applications with quite remarkable successes every now and then – education always seems to lag behind developments in society. Despite several decades lasting discussions on curriculum redesign, on the need for student control, and on related pedagogical issues, two basic premises of the system have been kept intact: the emphasis on the acquisition of knowledge *per se*, and the dominant, guiding role of the teacher or tutor. These premises contrast with more modern views that focus on competencies, and allow students to decide upon their learning objectives and learning activities themselves (Duffy and Jonassen, 1991). In the light of these findings, educational institutions can hardly be accused of exhibiting impressive innovative powers. When aiming at a truly innovative educational approach a number of aspects reflecting societal trends should therefore be taken into account:

- the growing need for flexible, tailor-made educational programmes that address individual needs
- the need to integrate learning and working environments
- the need for competence-based learning programmes

- the growing interest in distant education as an educational concept and delivery method
- the growing interest in a constructivist pedagogy
- the advent of new information and communication technologies with promising potentialities for education.

To address these trends the Open University of the Netherlands recently started an innovative pilot project called 'The Virtual Company'.

This article aims to outline the set-up of the Virtual Company and discuss its innovative properties. Moreover it focuses on the underlying educational design principles and elaborates on potentially far-reaching implications for the educational system. Considering that the Virtual Company addresses the societal trends observed above, and that it makes use of innovative methods for collaborative learning, it may rightfully be regarded a first step towards the development of third-generation distance education.

A Virtual Company

As stated, a Virtual Company is a learning environment built upon an extended role playing game in which the functional structures of real life companies are represented. The simulated company and the associated business tasks are thought to constitute a vehicle for the learning process, offering a concrete and meaningful context that resembles the real world in many respects. Being primarily a learning environment, though, the Virtual Company differs from real life companies as well, in that it structurally facilitates relevant educational functions like guidance, instruction, feedback and assessment. The Virtual Company differs a great deal from traditional educational approaches.

First of all it focuses on skills, or rather competencies, than on knowledge *per se*. Students in the Virtual Company adopt functions that are based on authentic (professional) function profiles that, in turn, cover a specific set of competencies. Secondly, unlike the traditional approaches for skills acquisition like wet practicals, real practical work, computer simulations and games or regular role-playing games, the Virtual Company is not to be regarded a closed, self-contained system, restricted to a confined set of tasks, skills or even outcomes. Within the Virtual Company students are immersed in an open, self-directing, collaborative system that supports the broad development of their personalities. In addition, teachers' control over what students learn, is much reduced. Another difference with ordinary skills training concerns the way assessment is carried out. Performances will be assessed using a large variety of assessment tools including tools for self-assessment and group-assessment, as students in the Virtual Company are expected to act as valuable sources of knowledge and experience themselves.

The concept of company-like educational systems is not a new one. There are many examples where students carry out group assignments that are situated in a company-like environment and are heading for professional, company-like performances. A first example would be the various management-game-like applications. The Virtual Company, however, by its very design does not confine itself to the domain of business administration, but may encompass almost any content domain whatsoever.

A second example would be a company-like environment that acts as a real business, developing real products for real customers. GipHouse is a case in pointi, being a simulated software house (GiPhouse, 1997). Students spend part of their study time in this simulated company. The Virtual Company, however, differs in that the notion of a simulated company

is developed within the context of distance education. On the one hand, it thus offers highly individualized learning opportunities that meet the students' individual learning objectives, ambitions and possibilities (Van den Boom and Schlusmans, 1995)). On the other hand, students have at their disposition electronic networking tools that allow them to be part of a distributed learning environment that supports collaborative work. Another difference with available company-like environments and role-playing games is that the Virtual Company does not restrict itself to the domain of business administration.

The Virtual Company thus constitutes an innovative educational approach. On what educational principles its innovative character rests will be discussed in the next section.

Educational design principles

The design of the Virtual Company is based on constructivist principles. Constructivism holds that knowledge and understanding arise from our interaction with the physical and social environment (Brown, Collins and Duguid, 1989; Duffy and Jonassen, 1991, 1993; Kolb, 1982, 1984; Vygotsky, 1978). Therefore, learning and understanding are regarded individual experiences that highly depend on the characteristics of the environment, the learning activities and the goals of the learner. They are considered to be an active process of knowledge construction within the environment rather than a passive process of knowledge reproduction about the environment. The validity of new knowledge and individual understanding is continuously being tested against new experiences and against the understandings of other individuals. From the perspective of an educator this implies not only that the environment be rich and sufficiently complex to provide students with sensible experiences, it should also actively support collaboration with others. Ultimately, knowledge acquisition is a process of social construction, reflecting social transactions and agreements. From these observations it may be concluded that the learning environment should resemble real life in many respects, which in itself is plausible because, eventually, learning is to serve our functioning in real life. For instance: the learning environment should exhibit a natural complexity that forces its inhabitants to develop tacit and implicit knowledge; by setting the learners authentic problems it should generate intrinsic motivation; it should resemble the future work place in order to meet societal needs; and, finally, it should support active collaboration with other inhabitants.

Collaboration has a dual function. Not only does it support the use of effective discursive learning methods (make explicit, discuss, reason, and reflect), it also serves the acquisition of essential social and communication skills. Students are thus conceived of as autonomous, self-supporting and responsible individuals who are capable of managing their own learning process, of deciding on their learning objectives, and of determining what learning activities are useful and what not. Note how these demands contrast with those in traditional learning environments that accommodate tutor guidance along pre-designed learning routes. Large though the difference may be, the constructivist approach should in no way be taken as support for a *laissez-faire* policy. It does not suffice for educational institutions merely to set up the environment and have students construct knowledge. Although the emphasis of the educators' tasks indeed shifts from control to facilitation, some basic control mechanism should be available to ensure an effective and efficient learning process. Such a mechanism concerns assignments, guidance, feedback and assessments. Occasionally even instruction may still be necessary.

Assignments provided for students should make good educational sense. Although one may imagine students in the Virtual Company to generate their own assignments or acquire

assignments from external customers, these will have to conform to a set of demands. In many cases real-life assignments may confuse students because of their high level of aggregation, their general, vague and ill-structured nature, and their calling upon a variety of competencies. Occasionally, assistance will be necessary to transform such assignments into a clearly specified set of tasks, each drawing on distinct competencies or knowledge subdomains.

If necessary, educators should be able to provide guidance, for instance by referring to useful learning tasks or to accompanying learning materials. In addition, adequate and timely feedback should be given. Indeed, much feedback may be provided in a 'natural' way – that is through the responses of other individuals or objects within the learning environment. It should be noted, though, that these means of feedback of their very nature are not necessarily correct. Also, in many cases they will go unnoticed. This implies that the learning process needs to be monitored continuously in order that interventions be made preventing ineffective or erratic learning. This is not to say that such mitigating measures invalidate the constructivist learning principles upon which the Virtual Company is built.

Frequent assessment of study progress is an important function to be implemented. Due to the competence-based approach traditional methods of examination and assessment should be supplemented with a variety of tools to allow for the assessment of operational performance levels, possibly to support a method of portfolio-assessment. However, assessment procedures should not only serve as tool for crediting students with recognised certificates. Such procedures should also be used to monitor the progress and to direct students, if needed, to remedial learning activities. In view of the rather autonomous nature of the Virtual Company, assessment procedures may indeed partly take the form of self-assessment methods for individuals or group assessment techniques.

Implications for the educational system

The concept of the Virtual Company has a number of implications for the educational system. Most importantly, the very idea of what constitutes knowledge changes. Traditionally, knowledge is seen as a distinct cultural asset, at a remove from the every-day real world. It is represented by explicit, codified, formal and often strongly hierarchical structures. This tradition perceives education as the mere transfer of such knowledge. Education in this sense is practised at the majority of our schools and universities. Crucially however, it forms only part of the knowledge that is needed to cope with complex real life situations. The Virtual Company as a learning environment requires that the concept of knowledge not be restricted to the information that is stored in books and journals, or that is usually taught in classrooms and lecture halls. Knowledge is considered to be to a large extent implicit, ill-structured, informal, and diffuse, as it reflects a great deal of context-dependency and often is connected with specific behaviours (diSessa, 1979).

Secondly, on this account of knowledge acquisition, education requires a rich and meaningful context, that cannot be offered by traditional classrooms and lecture halls. Upon closer analysis, one cannot but conclude that the traditional demarcation between learning and working needs to be removed. A curriculum has to be based on competence hierarchies rather than the traditional knowledge hierarchies. Furthermore, students' performances will have to be assessed by monitoring their functioning within practical, life-like contexts. And it is the mastering of competencies which determines the study progress rather than the mastering of knowledge *per se*. This implies that the concept of study-load as a function of, say, the number of lectures to attend or the number of printed pages to be studied, will

become obsolete. Ultimately, this observation may even give rise to adaptation of legislation.

As a third implication, educational institutions will have to rethink their role and position in the learning process. In traditional ways of teaching the classroom provides a self-evident baseline of unity, alliance and coherence, by forcing students to share the same location (classroom or lecture hall) at the same time (lecture hour). This kind of educational system can be regarded as a closed system, literally shielded by brick walls from the outside and paced by bells that keep time. The impact on pedagogical practice of such a closed system approach can hardly be overestimated. Educational processes are usually fully directed and controlled by the teacher and take place within the confines of the educational institutions. In contrast, the Virtual Company, using new communication technologies, constitutes a distributed learning community, which can act highly autonomously in consultation with the outside world. The Virtual Company can be regarded an open system where students interact with a world-wide network of resources, tools and experts to carry out their learning tasks. It means that the distinction between the inside world of education and the outside world of professionals is bound to disappear. Once we acknowledge that the educational system ought to be an essentially open system and that institutional knowledge constitutes only part of the relevant domain of knowledge, educational institutions cannot but share their responsibilities and autonomy with students, corporate partners, and external experts. Note how these convictions match quite well with the constructivist principles.

A veritable paradigm shift

So far, we have tracked the implications that the notion of a Virtual Company has for our educational systems and concluded that it does indeed constitute a major shift in educational paradigm. However, one may well argue that, revolutionary though the shift may be from an educational perspective, it really only reflects a trend which has been operative in society for some time already: a breaking away from the 'manufacturability' myth and the dislodgement of traditional centres of control. What this amounts to can best be illustrated by first examining the radically changed ways in which communication systems have been used in recent history; subsequently, we'll look at society al large.

For many centuries handwriting or printed texts have been the only means with which people could communicate when face-to-face communication was impractical. Such texts are stories fully under the control of the author or, in recent times perhaps more accurately, the publishing company. Written texts are produced by an author, the reader is left no other role than consume the author's generic product. The introduction of the television brought little change to this picture. Television broadcasting companies manufacture complete programmes, which are distributed among a population of viewers. However, indications abound that viewers are not very happy with their role of pure consumers, lacking any kind of control over the product. Probably quite unintentionally, the introduction of remote control devices for television sets gave viewers the opportunity to construct their 'own programme' to some extent by rapidly zapping along the various network channels (De Kerckhove, 1996). In the ensuing struggle for control the television production companies reacted by increasing the shot rate in their programmes, and by deliberately searching for other ways of enhancing the number of visual stimuli. Yet there is an essential difference between television and texts. For the first time, television was able to create a sense of collectivity among its viewers. Unlike books, television addresses many viewers simultaneously. This sense of collectivity appears to be highly motivating and may well explain the huge popularity and impact of television.

The advent of the personal computer, which started in the early eighties constituted a further change. The personal computer allows consumers really to construct their own 'programmes' by feeding it their individual inputs. Software companies focus on meta-design utilities, such as text editors or spread-sheet programs, to support this trend towards individualized products. The advent of the personal computer was considered a severe threat to the television market. However in its early years the personal computer was primarily a stand-alone apparatus, incapable of stirring up the sense of collectivity television could provide. For this reason the personal computer has appeared to be incapable of surpassing television's popularity.

The introduction of Internet applications in the early nineties changed all this. It transformed the stand-alone personal computer into a networking station, capable of world-wide communication via electronic mail, newsgroups, conferencing, hypertext documents (WWW), or even synchronous multi-user applications. It offers an infrastructure which allows for both individual inputs and collaboration with others, thus embodying a titillating platform in which users perform as both producers and as consumers. It combines the interactivity of stand-alone personal computers with the sense of collectivity of television.

In summary, we see a trend towards a communication process, showing more control of the end-users and less of the initial producer. This constitutes a breaking away from the so-called manufacturing paradigm, which has been popular since the 19th century industrial revolution (Cox, 1996). This manufacturing paradigm represents a technocratic perspective on society, reducing all human actors to indifferent objects that are endlessly malleable. It is, however, far too simple to describe complex human systems, let alone guide attempts to control it. For instance, the central planning and design of economy, omitting human factors, has proven to fail dramatically. This holds for the former communist economies as well as for the entire western world trying to regulate and control the economic processes. According to Nobel-prize winner Friedrich Hayek (Hayek, 1945, 1991; Anderson, Arrow and Pines, 1988) the traditional way of modelling society fails because it holds for formal knowledge only, omitting informal, local, tacit and ill-articulated knowledge of individuals. In his view, any description of human systems should make room for complex human behaviours like co-operating, being obstinate, having confidence, or taking risks. Economy should be considered as a biological system rather than a technological one: it evolves through autonomous actions of individuals and it creates new features according to its internal laws and conditions. Thus each human system should be viewed as an evolutionary system, showing organic and autonomous development that is only moderately sensitive to external control. This conclusion should also hold for educational systems.

Now we can see how traditional education exemplifies the manufacturing paradigm. The roles and functions of educational institutions may well be represented by a simple black box, with ignorant novices acting as inputs and graduates with a predefined knowledge level as outputs. Teaching here is regarded as a production process, students are the passive objects that are processed to meet a predefined set of product qualifications, while society consumes those products. The attitude of the educational establishment may perhaps best be likened to that of television companies. Educational institutions offer a complete programme to an extended target group of consumers. Although they are willing to take some measures to please their consumers, they are hardly prepared to give up control. Educational systems should realise that, although the technocratic view suggests otherwise, they lack the knowledge, the power, and the instruments to train people to become competent, responsible and self-supporting professionals. As a human system, it should be the educational establishment's true vocation to focus on facilitating and supporting the students' learning process, not on controlling it.

Distance education fares somewhat better. Its institutions resemble the personal computer industry, while strongly focusing on meta-design and offering students much control over what to study, where to study, when to study, and at what pace to study. However, distance education fails in another way. Usually, it is implemented as an individualized self-directed study programme and thus lacks the appreciated sense of collectivity that regular educational institutions offer.

The educational setting that the Virtual Company offers, however, solves both problems. It constitutes a learning environment where students work both individually and collectively in a highly autonomous way, an environment also that is open to the rest of the world. It truly meets the criteria for organic and autonomous development by delegating a great deal of self-direction and responsibility to the students themselves. From this perspective, the Virtual Company indeed is the logical next step in educational innovation.

Prospects

At present the Virtual Company is in the stage of design and development. A first pilot run is planned for 1998; operation at a regular basis for 1999.

Although the new educational concept deviates strongly from the current approach, a lot of tools, expertise, and empirical data are available within the Open University of the Netherlands to suggest a prosperous start. Yet, quite a research effort is foreseen to evaluate the quality and the appreciation of the learning environment, the reliability of the technological means, the effectiveness of student autonomy, the human communication patterns covering both co-operation and conflict, the characteristics of guidance and support functions, and in particular the validity of assessment tools. The most crucial question, however, will be at what stage and to what extent educators should intervene in the learning process as opposed to letting students solve their own problems.

The first pilot will be carried out within the domain of the natural and technical sciences. It either mimics an environmental consulting company, or an institute for environmental health care, or a software company. However, it is recognized that expertise from other domains must be available as well. To some extent, our technical and natural science students should be able to acquire basic knowledge and skills on legal procedures, finance, or human resource management. For specialists' tasks in these areas it would be appropriate also to recruit students from other faculties, thus realizing a heterogeneous student population with a variety of expertise, tasks and learning objectives. Future developments could even show the clustering of various virtual companies into a virtual business park catering for different specializations, mutual transactions, or even competition. One may well wonder whether such extensions are to be decided upon by educators or by the virtual student community itself.

References

Anderson, P. W., Arrow, K.J. and Pines D. (1987). *The economy as an evolving complex system: the proceedings of the evolutionary paths of the global economy workshop, held September, 1987 in Santa Fe, New Mexico*, Addison-Wesley, 1988.

Brown, J.S., Collins, A. & Duguid, P. (1989) *Situated cognition and the culture of learning*, Educational Researcher, 18, 32-42.

Cox, B. (1996). The online classroom in K12, in Berge, Z. and Collins, M (eds) *Computer mediated communication and the online classroom*, Cresskill, New Jersey, Hampton Press.

De Kerckhove, D. (1996). *Gekoppelde intelligentie, de opkomst van de WEB-maatschappij (Coupled Intelligence, the advent of the WEB society)*, Stichting Maatschappij en Onderneming.

diSessa A.A. (1979). Representation of knowledge: a meaning for the computational metaphor, in Lockhead J. and Clement J. (eds) *Cognitive Process Instruction*, Philadelphia.

Duffy, T. M. & Jonassen, D. H. (1991). *Constructivism: New implications for Instructional technology?*, Educational Technology, May , 7-12.

Duffy, T. M. & Jonassen, D, H (1993). *Designing environments for constructivist learning*, Berlin, Springer Verlag.

GipHouse (1997). *A simulated software house at the University School of Informatics of the University of Nijmegen*, Nijmegen, The Netherlands, 1997.

Hayek, F. A. (1945). *The Use of Knowledge in Society*, American Economic Review, XXXV, 519-530.

Hayek, F. A. (1991). *Economic freedom*, Institute of economic affairs, Basil Blackwell ltd., Oxford

Kolb, D. A. (1982) *Experience, learning, development: The theory of experiencial learning*, Prentice Hall, Englewood Cliffs, New Jersey

Kolb, D. A, (1984). *Experiential learning*, Prentice Hall, New Jersey.

Van den Boom, G. and Schlusmans, K. (1995). *Didactics and course developments at the Open University of the Netherlands*, Open Universiteit, Heerlen

Vygotsky, L. (1978). *Mind in society*, Harvard University Press, Cambridge, MA.