

LIFELONG LEARNING IN THE KNOWLEDGE SOCIETY

Implications for education

Tom van Weert

Hogeschool van Utrecht, University for Professional Education, The Netherlands; Cetis, P. O. Box 85029, 3508 AA Utrecht, The Netherlands; Tel: + 31 30 258 6296, Fax: +31 30 258 6292

t.vweert@cetis.hvu.nl; <http://www.cetis.hvu.nl>

Abstract: A Knowledge Society is developing in which Information and Communication Technology is both a catalyst and a necessity. Knowledge is an invaluable asset in this ICT-integrated society, both *tacit knowledge* in the heads and hands of the workers and *explicit knowledge*. *Human capital* is becoming more and more important. Innovation is driving force in knowledge intensive economies. Therefore application and creation of new knowledge are normal part of the work of modern professionals: lifelong working implies *lifelong learning*. Students are the professionals of tomorrow and need to develop the competences of the knowledge worker. This implies a change in educational paradigm and educational transformation to *new education*. For developing countries and transition economies this offers threats and opportunities.

Key words: education, human capital, innovation, knowledge, knowledge worker, learning organisation, pedagogy, real-life learning, student, transformation

ICT-INTEGRATED KNOWLEDGE SOCIETY

A Knowledge Society is developing in which Information and Communication Technology is both a catalyst and a necessity. Knowledge is an invaluable asset in this ICT-integrated society where production, services, consumption and trade are rapidly changing. To keep up with developments (knowledge) workers need to adapt continuously and acquire new competences: working and learning melt together. At the work place new knowledge is created to keep up with developments: both tacit knowledge in the heads and hands of the workers and explicit knowledge (codified, operational knowledge). The concept of knowledge is changing from scientific, theoretical knowledge ('old knowledge') to more operational knowledge ('new knowledge'). Human capital is becoming more and more important and workers become more and more responsible for all dimensions of their work.

KNOWLEDGE ECONOMY AND ICT

"The concepts of '*knowledge economy*' and '*knowledge worker*' are based on the view that information and knowledge are at the centre of economic growth and development. The ability to produce and use information effectively is thus a vital source for skills of many individuals" (2000b). "Technological change and innovation drive the development of the knowledge-based economy through their effects on production methods, consumption patterns and the structure of economies. Both are closely related in recent growth performance. Some changes in innovation processes could not have occurred without ICTs and conversely, some of the impact of ICTs might not have been felt in the absence of changes in the innovation system." (OECD 2000a).

WORKING IS LEARNING

"A knowledge-based economy relies primarily on the use of ideas rather than physical abilities and on the application of technology rather than the transformation of raw materials or the exploitation of cheap labour. Knowledge is being developed and applied in new ways. Product cycles are shorter and the need for innovation greater. Trade is increasing worldwide, increasing competitive demands on producers." (World Bank 2002b, p.ix). In the knowledge economy, change is so rapid that workers constantly need

to acquire new skills. Firms need workers who are willing and able to update their skills throughout their lifetimes. (ibid)

To keep up with developments in a knowledge-intensive economy (knowledge) workers need to adapt continuously to new developments: they are in a process of Lifelong Learning. “In the old economy, the basic competences of the industrial worker, bricklayer, or bus driver were relatively stable. True, you might have applied these competencies to different situations, such as different construction sites, but the learning component of your labour was small. In the new economy, the learning component of work becomes huge. Think about your own work. Work and learning overlap for a massive component of the workforce.” (Tapscott 1996, p. 198).

KNOWLEDGE CREATION AT THE WORK PLACE

“In the knowledge economy the term knowledge was used originally to denote scientific knowledge. However, partly under the influence of Information and Communication Technology the concept of knowledge is broadening: knowledge, wherever it is stored, becomes available. Knowledge in the heads of or hands of workers can be codified; tacit knowledge can be a commercially valuable asset” (WRR 2002; p. 22; author’s translation). Mass distribution of ICT and the Internet seem to contribute towards the development of new knowledge and new attitudes towards knowledge. The concept of knowledge has been extended from purely theoretical knowledge (‘old knowledge’) to knowledge that is also more practice-oriented (‘new knowledge’). (WRR 2002)

HUMAN CAPITAL

Long term developments lead to fundamental changes in economic activities and put more weight on unique human qualities such as knowledge creation. Robotic type of work is taken over by automates. “To adapt and maintain competitiveness in response to changing consumer preferences and technological change, companies need appropriate organisational structures, a skilled workforce and able management. These changes are having a significant impact on the structure of employment and on the type of labour required. The most obvious manifestation of this is the rising human capital levels of the populations and workforces in OECD countries, as measured by the educational attainment and as implied by an increased demand for more

highly-educated and highly-skilled workers.” (OECD 2001; p. 102) Human capital is becoming more and more important and allows workers more freedom in giving form to their work commitments. Supported by Information and Communication Technology they become more and more responsible for all dimensions of their work. This contributes to the ‘wholeness’ of working life. “More and more people give meaning to their lives in paid professional work. The reason for this is the changing character of work. By and by an ‘enterprising’ society of dynamic professionals is developing.” (Beek 1998).

THE LEARNING ORGANISATION

“These changes also have affected the way in which organisations interact in the economy, with networking, co-operation and the fluid flow of knowledge within and across national borders gaining in importance.” (OECD 2001; p. 100/101) “To keep up with demands and competition innovative businesses and organisations have to create new operational knowledge in their domain: how to do better and how to offer new products and/or services. In a learning organisation work is organised in non-traditional ways and professionals work in a different way. A shift can be observed from organisational structures suited for efficient, standard, large-scale throughput (Tayloristic, old economy) to structures that facilitate flexible, custom-tailored, small scale, high quality production or servicing (networked, new economy). These new organisational structures aim to satisfy a personal, demand-driven market and are reflected in organisational concepts such as “Just In Time”. The new structures are geared towards teamwork, flexibility and quality. Information and Communication Technology (ICT) is omnipresent and empowers the individual to act as expert in many areas. ICT also offers flexibility in time and place in support of teamwork.” (Weert 2002).

WORKING AND LEARNING MELT TOGETHER

Innovation is driving force in knowledge intensive economies. Therefore the economical focus is on knowledge work: new application of existing knowledge and knowledge creation. Knowledge application and knowledge creation are normal part of the work of modern professionals. The modern professional is a knowledge worker for whom lifelong working implies *lifelong learning*.

Knowledge workers

Knowledge work is organised in non-traditional ways. Aim is to satisfy demand-driven market and the organisation of work is geared towards teamwork, flexibility and quality. Information and Communication Technology (ICT) is omnipresent and empowers the individual to act as expert in many areas. ICI also offers flexibility in time and place in support of teamwork. Work is result oriented and the professionals are accountable on results: team and organisation form a meritocracy.

The new professionals give meaning to their lives through their work. They continually engage in new challenges and learn on the job. They therefore need other skills than in the 'old fashioned' Tayloristic economy. "Social-communicative and social-normative skills and competences (soft skills or people skills) are needed to be able to function adequately in teams and cooperate with colleagues: communication skills, empathy, team player skills. Self-direction and autonomy require initiative, pro-activity, flexibility and risk taking of professionals." (WRR 2002; p. 148). Another of these new qualifications is the capability to deal with a professional environment characterized by fast change. For the modern professional lifelong working is identical with Lifelong Learning; the modern professional is a learning professional." (Weert 2004).

Table 1. Traditional versus Lifelong learning

Traditional learning model	Lifelong learning
The teacher is the source of knowledge	Educators are guides to sources of knowledge
Learners receive knowledge from the teacher	People learn by doing
Learners work by themselves	People learn in groups and from each other
Tests are given to prevent progress until students have completely mastered a set of skills and to ration access to further learning	Assessment is used to guide learning strategies and identify pathways for future learning
All learners do the same thing	Educators develop individualized learning plans
Teachers receive initial training plus ad hoc in-service training	Educators are lifelong learners. Initial training and on-going professional development are linked
"Good" learners are identified and permitted to continue their education	People have access to learning opportunities over a lifetime

STUDENTS AS THE KNOWLEDGE WORKERS OF TOMORROW

“The first question to be answered is: “What is learning”. Here we assume that learning is the use and the creation of new operational knowledge (Go & van Weert 2004) that steers our actions. Learning is a social activity in which interactions with the environment (human and non-human) play an important role. As the IFIP Focus Group Report (2004) states: “Traditional education methods are ill suited to providing people with the skills they need to be successful in a knowledge economy. The traditional learning model differs from lifelong learning methods in important ways. Table 1., emphasizing these differences, is taken from a World Bank Lifelong Learning report (World Bank 2002b, p.xi).

There is need for a paradigm change from ‘acquisition view’ to ‘constructivism view’ as presented by Duffy (Table 2.).“

Table 2. Contrasting views of learning (Duffy 2001)

	Constructivism view	Acquisition view
Learning is	Organic Continual reorganisation	Cumulative Discovery (finding what is known)
Knowledge is	Invention <i>A construction</i>	<i>An acquisition</i>
Coach-apprentice relation is	Mutual respect for views Ability to converse	Transfer of coach’s expertise
Assessment is	Ability to use knowledge	Mastery of content

NEW EDUCATION

Real-life learning

Lifelong Learning takes place in a real life setting where new knowledge has to be created and applied. In this real life context learning is aimed at developing operational knowledge to perform better as a professional or to become a starting professional. Working as a professional may be characterised by the following three phases (Simons 2001):

1. *relate*: working with knowledge, learning-on-the-job and making explicit the implicit results of learning;
2. *create*: extending knowledge by, for example, carrying out research, explicit learning;

3. *donate*: putting into practice, presenting, promoting one's own knowledge, contribute to the profession.

Professional development is not part of everyday schoolwork in class, so it needs an extra effort. Universities should work in co-operation with business, industry and other organisations in the field to develop and implement programmes which are intended to give students optimum preparation for the reality and dynamics of professional practice (Go & van Weert 2004). These new programmes aim to provide learning environments which enable students to develop into starting professionals: they develop their competence and professional expertise in learning environments of varying complexity. The introduction of new competence-based programmes means adopting a new methodology and this assumes that the tutor also develops competencies and professional expertise in relation to the programme (Wittelman 2001).

New pedagogy

A new pedagogy is needed in education for learning in authentic, real-life situations. Herrington, Oliver, and Reeves (2002) have defined ten design principles for developing and evaluating authentic activity-based learning environments. Authentic activities must:

1. Have real-world relevance.
2. Be ill defined, requiring students to define the tasks and sub-tasks needed to complete the activity.
3. Comprise complex tasks to be investigated by students over a sustained period of time.
4. Provide the opportunity for students to examine the task from different perspectives, using a variety of resources.
5. Provide the opportunity to collaborate.
6. Provide the opportunity to reflect and involve students' beliefs and values.
7. Be integrated and applied across different subject areas and extend beyond domain-specific outcomes.
8. Be seamlessly integrated with assessment.
9. Yield polished products valuable in their own right rather than as preparation for something else.
10. Allow competing solutions and diversity of outcomes.

Herrington et al. (2004) state: "In direct contrast to the academic approach, practical problems tend to be characterized by: the key roles of

problem recognition and definition, the ill-defined nature of the problem, substantial information seeking, multiple correct solutions, multiple methods of obtaining solutions, the availability of relevant prior experience, and often highly motivating and emotionally involving contingencies (Sternberg et al., 1993, p. 206). Key differences between the school-based approach and real-life approach are summarised in Table 3 (Lebow & Wager 1994).

Table 3. Real-life versus in-school problem solving (Lebow & Wager 1994)

Real-life	In-school
Involves ill-formulated problems and ill-structured conditions	Involves text-book problems and well-structured conditions
Problems are embedded in specific and meaningful context	Problems are largely abstract and de-contextualised
Problems have depth, complexity and duration	Problems lack depth, complexity and duration
Involves cooperative relations and shared consequences	Involves competitive relations and individual assessment
Problems are perceived as real and worth solving	Problems typically seem artificial with low relevance for students

Institutional transformation

Educational institutions will be forced to creatively rethink and renew institutional organisation. As Büetner et al. (2004) state: “ICT becomes an integral though invisible part of the daily personal productivity and professional practice. The focus of the curriculum is becoming learner-centred and integrates subject areas in real-world applications. For example, students may work with community leaders to solve local problems by accessing, analysing, reporting, and presenting information with ITC tools. Learner’s access to technology is broad and unrestricted. They take more responsibility for their own learning and assessment. The institution has become a centre of learning for the business community.”

When transforming, educational institutions will have to develop (Büetner et al. 2004):

- Vision;
- Philosophy of learning and pedagogy;
- Development plans and policies;
- Facilities and resources;
- Understanding the curriculum;
- Professional development of institution staff;
- Communities;
- Assessment.

DEVELOPING COUNTRIES AND TRANSITION ECONOMIES

The Knowledge Society impacts on our global environment, entailing opportunities and threats for developing countries and transition economies. See Table 4 (World Bank 2002A; p.8).

Table 4. Opportunities and threats stemming from changes in the global environment

Change factor	Opportunities	Threats
Growing role of knowledge	Possibility of leapfrogging in selected areas of economic growth Resolution of social problems (food security, health, water supply, energy, environment)	Increasing knowledge gap among nations
ICT revolution	Easier access to knowledge and information	Growing digital divide among and within nations
Global labour market	Easier access to expertise, skills, and knowledge embedded in professionals	Growing brain drain and loss of advanced human capital
Political and social change	Positive environment for reform	Growing brain drain and political instability
Spread of democracy		Loss of human resources
Violence, corruption, and crime		
HIV/AIDS		

“Tertiary education institutions have a critical role in supporting knowledge-driven economic growth strategies and the construction of democratic, socially cohesive societies. Tertiary education assists the improvement of the institutional regime through the training of competent and responsible professionals needed for sound macroeconomic and public sector management. To successfully fulfil their educational, research, and informational functions in the 21st century, tertiary education institutions need to be able to respond effectively to changing education and training needs, adapt to a rapidly shifting tertiary education landscape, and adopt more flexible modes of organization and operation.” (World Bank 2002a, p.23)

“Developing countries and transition economies risk being further marginalized in a competitive global knowledge economy because their education and training systems are not equipping learners with the skills they need. To respond to the problem, policymakers need to make crucial changes. They need to replace the information-based, teacher-directed, directive-based rote learning provided within a formal education system with

a new type of learning that emphasizes creating, applying, analyzing, and synthesizing knowledge and engaging in collaborative learning throughout the lifespan.” (World Bank 2002b; p.ix).

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BIOGRAPHY

Tom J. van Weert holds the chair in ICT and Higher Education of the Hogeschool van Utrecht, University of Professional Education and Applied Science, Utrecht, The Netherlands. Earlier he was managing director of Cetus, centre of expertise for educational innovation and ICT, of the same university. Before that he was director of the School of Informatics (Computing Science) at the University of Nijmegen, The Netherlands. Tom has studied applied mathematics and computing science. He started his working career in teacher education and software engineering. He has been chair of the International Federation for Information Processing (IFIP) Working Groups on Secondary Education and Higher Education. He currently is vice-chair of IFIP Technical Committee 3 (TC3) on Education. He is also member of the TC3 Taskforce on Lifelong Learning.

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