

MOODLE E-LEARNING ENVIRONMENT – AN EFFECTIVE TOOL FOR A DEVELOPMENT OF A LEARNING CULTURE

Virve Siirak

Tallinn University of Technology, Chair of Working Environment and Safety, Estonia.

E-mail: vsiirak@staff.ttu.ee

The 21st century, structural changes in our industries and economics, globalization of our world need responsible new engineers and scientists. New competence requirements in the ICT (information and communication technology) sector and in information and knowledge work mean new challenges for national educational systems. In particular, traditional technical and higher engineering education needs critical evaluation and a broadening of curricula with knowledge traditionally included in social sciences. Understanding of human and organizational behaviour, cultural understanding, communication and language skills, and the capacity for conceptual thinking are important competencies needed in the future.

In this paper it is argued that blended learning with computer based learning in the Moodle e-learning environment based on social constructivist learning theory is an effective tool for teaching and learning of Occupational Health and Safety discipline (OHS) – including chemical risks and human factor issues, for future engineers and managers. The author has six years experience of computer based teaching. The author's own teaching experience of the Moodle e-learning environment for creating and providing different courses in the Tallinn University of Technology and in the Virumaa College of Tallinn University of Technology (located in the Ida-Viru County of Estonia and the Tartu College of Tallinn University of Technology, will be presented.

According to the questionnaires given to students at the end of each course, the teaching and learning in the Moodle e-learning environment as blended learning is very useful for development of a learning culture. The effectiveness and motivation for learning are higher than providing traditional methods of learning. New possibilities and dimensions for teaching and learning are opened which will develop the learning culture.

INTRODUCTION

Increasing access to more and better information is available by rapidly development of technology. The impact of rapid development of Infocommunication Technology (ICT) to all aspects of the society is described by Bradley 2001, Järvenpää 2001. To help students turn information into knowledge, teachers need to know the new teaching strategies. Psychosocial risks, musculoskeletal disorders and dangerous substances are among the priority areas for future Occupational Health and Safety research in European Union. The report *Priorities for Occupational Safety and Health Research in the EU-25*. According to this report a vast and increasing number of chemicals are present in workplaces, with about 100 000 different substances currently registered in the EU market. The chemical industry

is Europe's third largest manufacturing industry, employing 1.7 million people directly, with up to three million jobs dependent on it. Exposure to dangerous chemicals occurs at many workplaces outside the chemical industry: for example agricultural workers use pesticides, detergents and microbiological dusts, and construction workers commonly use solvents and paints. According to the third European survey on working conditions (2000), 16% of employees in the EU handle or are in contact with dangerous substances for at least on quarter of their working time. There are three main research priorities in this field: the validation and improvement of models for workers exposure assessment, the exposure to nanoparticles and ultrafine particles and assessment and measurement methods for workplace exposure to biological agents. Chemical Engineers now have a rising capability of computing resources available to them.

In this situation, new challenges for the higher education are continued. The growing interest of blended learning (combination of traditional teaching methods of face to face and online media) in higher education is indicated by the increasing number of studies in this area (Poole 2006, Irons et al. 2002; MacDonald and McAteer, 2003; O'Toole and Absalon, 2003; Stubbs and Martin, 2003). For example at the University of Central England in Birmingham (UCE), academic staff are encouraged to incorporate both traditional and web-based ICT (information and communication technology) modes of teaching and learning in the courses they deliver, using Moodle software. Preliminary quantitative evaluations at UCE have revealed that over 70 percent of the 388 students in the sample from across all faculties claimed to have enjoyed using the web-based aspects of blended courses. Over 75 percent of a sample of 329 students felt that Moodle had helped them learn the subject and nearly 80 percent of the sample reported that they would like future modules be blended in this way (Poole, 2006; Staley 2005).

COMPUTER BASED TEACHING AND LEARNING EXPERIENCE IN TALLINN UNIVERSITY OF TECHNOLOGY

Tallinn University of Technology is a national technology university of international repute, an active cooperation network partner at the forefront of Estonia's knowledge-based economic development. (Strategy 2006)

In Tallinn University of Technology (TUT) (former Tallinn Technical University) The discipline of Risk and Safety Sciences based on ergonomics knowledge has been taught for more than 20 years (Kristjuhan 1994).

In September 1999 a new ergonomics laboratory with computers was installed in Tallinn University of Technology (TUT). These facilities help to inspire for searching Health and Safety information in Cyberspace for their studies based on Problem Based Learning (Siirak, 1999, 2000; 2001, 2002 Tint, 2000) The course of Risk and Safety Sciences for students of the Faculty of Chemical Engineering and Gene Technology (Bachelor level) was provided autumn 2001 by V. Siirak. During practices students were inspired to use the internet and find the modern Occupational Health and safety information from internet databases and to use the databases of the European Agency for Safety and Health and Work, the Health&Safety Executive, UK, the U.S. National Institute of

Occupational Safety and Health (NIOSH) etc. The special web-site for the students was prepared. For different courses.

MOODLE E-LEARNING ENVIRONMENT

Since autumn 2006 the courses of Risk and Safety Sciences and Working Environment and Ergonomics were created in Moodle e-learning environment. All courses are provided as blended learning: the traditional method face-to-face is blended of web-based support in Moodle e-learning environment. Autumn 2006 the first course of discipline of Working Environment and Ergonomics was provided for full-time students of the Faculty of Economics and Business Administration in the Moodle e-learning environment. In this course participated 166 students (Bachelor level). Spring 2007 this course was provided with 72 participants for distance learning students of the Faculty of Economics and Business Administration. Spring 2007 also the course of the Risk and Safety Sciences for students of Production Engineering and Entrepreneurship in the Virumaa College of TUT was created and provided for 14 students and the Course of Risk and Safety Sciences for 72 students of Landscape Architecture and Construction in the Tartu College of TUT was created and provided. The course were provided as blended learning where the classroom activities were supported by Moodle e-learning environment. Autumn 2007 the Master level Course of Chemical Risks for future Industry Hygienists was provided as blended learning with Moodle e-learning environment. for 7 students. The assignments in Moodle learning environment were related with working with international professional databases of chemical risks (first year in Moodle e-learning environment).

AIM OF THE STUDY

The aim of the study is to find out how students appreciate the courses provided in Moodle e-learning environment.

MATERIAL AND METHOD

At the end of the courses a questionnaire was given to all groups of students. The questionnaires were given for 57 students in the course of Working Environment and Ergonomics (Bachelor level), (100% were filled) and for 14 students of the course of Risk and Safety Sciences in the Virumaa College of TUT (Diploma level) (100% were filled), for 42 students of the course of Risk and Safety Sciences in the Tartu College of TUT (Diploma level) and for 14 students of the course of Risks of Social Environment (Master level). (100% were filled). After the Master level course of the Chemical Risks for future Industry Hygienists the questionnaire was given for 7 students (100% filled).

Students had to answer to 5 questions:

1. How do you appreciate the Moodle e-learning environment?
2. Which part of the course was most interesting for you?

3. Which part of the course was unclear for you?
4. How do you will to use obtained knowledge in practice?
5. What do you like to learn more?

RESULTS

Of respondents 100% answered that Moodle e-learning environment is very effective learning tool. Students wrote that they are encouraged and motivated to learn more in Moodle e-learning environment and they do not like to learn courses which are not in Moodle e-learning environment. The materials in Moodle e-learning environment are clear. Of respondents 80% answered that their participation in forums and othet activities available in Moodle e-learning environment is very useful for learning from each other obtaining new knowledge. Some students wrote that availability of course materials and activities in Moodle e-learning environment encourage their interest for clasroom activities and the face to face contact with teacher is now in a new level. Students appreciate high that they can learn in Moodle e-learning environment the time and place suitable for each student. Some students wrote that the experience of learning in Moodle e-learning environment is helpful for development of their self- discipline.

Very interesting is that student who havedsuccessfully finished the course continued their participation in the course in Moodle e-learning environment. For example autumn 2006 the first course of the discipline of Working Environment and Ergonomics was provided. From 166 students finihed the course successfully, 130 students today continued their participation in the course in Moodle e-learning environment. E-learning community is established.

The Master Level Course of Chemical risks for industrial hygienists was the first year course in Moodle e-learning environment. The comparison of this courses before Moodle introduced is impossible.

DISCUSSION

According to my experience with computer based learning since the year 2001, providing of courses in Moodle e-learning environment are more effective than providing the courses where course materials are available on the website. Very effective is that students activities from participation in learning forums and learning from each other are encouraged. The problem is that sometimes students hesitate to participate in learning forums, they are sometimes afraid that other students can read their letters to learning forums. The efficiency of learning process is depending on the style of creation of the course. The course had to be designed simply and clearly encouraging students own activity in the learning process. The assignments encouraging students activity have to be provided. In comparison of previous results before Moodle was introduced (only materials were available on the website), students are more satisfied and motivated to learn the discipline. Students appreciate high that can fill all the assignments in Moodle e-learning environment, what is

more suitable for students. Before Moodle was introduced the filling the different assignments was more complicated. There is no statistical differences of the satisfaction of the courses before Moodle was used. Before Moodle was introduced all the solutions of web based learning were highly appreciated by the students in comparison of traditional courses without using web tools. After Moodle was used, the motivation of students and their own activity in the learning process, the students interpersonal contacts (learning from each other) were successfully increased. After Moodle was introduced, for the teacher the online contact with students and monitoring their activities is successfully improved.

CONCLUSIONS

In the 21st century, where structural changes in our industries and economics, globalization of our world need responsible new engineers and scientists, new challenges for the higher education and learning culture are continued. and new possibilities, dimensions and solutions are opened.

One of the new possibilities and solutions is blended learning using the Moodle e-learning environment.

Moodle e-learning environment is a very effective learning tool supporting blended learning which encourages the students motivation for learning activity and interest to the course, developing the learning culture. We have to be open for future development of Moodle e-learning environment according to rapid development of ICT (information and communication technology) dimensions and new possibilities and solutions for developing the learning culture.

ACKNOWLEDGEMENTS

The author would like to express the gratitude to the European Commission and Estonian National ICT program for Higher Education for supporting the creation of the Course of Working Environment and Ergonomics in Moodle e-learning environment autumn 2006 (EITSA 2 ESF project REDEL).

REFERENCES

- Bradley, G. *Information and communication technology (ICT) and humans – how we will live, learn and work*. In: Bradley, G. Editor. *Humans on the Net*. Stockholm:Sweden, Prevent, 2001,pp. 22-44. ISBN 91-7522-701-0.
- Irons, L.R., Keel, R., and Bielema;C. L. *Blended Learning and Learner Satisfaction. Keys to user acceptance*, USDLA Journal 16(12), 2002
- Järvenpää, E., Eloranta, E., *Information and communication technologies and quality of working life: implications for competencies and well-being*. In: Bradley, G. Editor. *Humans on the Net*. Stockholm:Sweden, Prevent, 2001,pp. 109-118. ISBN 91-7522-701-0.

- Kristjuhan, Ü., *Increasing the efficiency of thinking in ergonomics research*. In: Nordiska Ergonomisällskapetets Årskonferens NES'94, Stenungsund, Sverige, 1994.
- O'Tools, J.M., and Absalom, D.J., *The impact of Blended Learning on Student Outcomes: Is there Room on the Horse for Two ?* Journal of Educational Media 28(2/3), 179-91.2003
- Poole, J., *E-learning and e-learning styles: students' reactions to web-based Language and Style at Blackpool and the Fylde College*. Language and Literature 2006; 15; 307. The online version: <http://lal.sagepub.com/cgi/content/abstract/15/3/307>
- Siirak, V., *Didactic experience of risk and safety education in Estonia*. In: Pacholski, L.M., Marcinkowski, J.S., (Eds): Certification and Accreditation of Ergonomics, Labour Protection and Work Safety Education. Proceedings of the 16th International Seminar of Ergonomics Teachers. Poznan University of Technology, Poland, 1999. Pp, 199-203. ISBN: 83-906191-2-5.
- Siirak, V., Kristjuhan, Ü., *Experience of problem-based learning in ergonomics and safety education in Estonia*. In: D.de Waard, C. Weikert, J. Hoonhout, J. Ramaekers (Eds) Human-System Interaction: Research and Application in the 21st Century, The Netherlands: Shaker Publishing, 2000. Pp. 99-106. ISBN 90-423-0126-0.
- Siirak, V., *Influencing behaviour through learning of ergonomics knowledge in Cyberspace: a new millennium strategy to the reduction of health risks and accidents at working environment in Estonia*. In: K.E. Fostervold, T. Endestad (Eds): At the gateway to Cyberspace-ergonomic thinking in a new millennium. Oslo: Nordiska Ergonomisällskapet. 2000. Pp. 225-228.
- Siirak, V., Kristjuhan, Ü. *Changing Paradigms for Ergonomics and Safety Educational Technology in Estonia*, Proceedings of the Second International Conference ERGON-AXIA 2000 - Ergonomics and Safety for Global Business Quality and Productivity, Warsaw, Poland, 19-21 May, 2000, pp. 293-296, ISBN: 83-87354-54-6.
- Siirak, V. *Some Possible Solutions for Improving the Estonian Working Environment Proposed by Students of Tallinn Technical University*. In: People in Control: An International Conference on Human Interfaces in Control Rooms, Cockpits and Command Centres. Conference Publication, . 19-21 June 2001, UMIST, Manchester, United Kingdom. IEE 2001. Pp. 340-344.
- Siirak, V. *New challenge for ergonomics and human factors education in technical universities*. In: Promotion of Health through Ergonomic Working and Living Conditions. Outcomes and methods of research and practice. Proceedings of NES 2001 Nordic Ergonomics Society 33rd Annual Congress, 2-5 September 2001, University of Tampere, Finland. pp. 210-212. ISBN: 951-44-5168-6.
- Siirak, V. *New Challenges for Human Factors and Ergonomics Education in Technical Universities*- CD ROM, WorkCongress6: 6th International Congress on Work Injuries, Prevention, Rehabilitation and Compensation, 30 November-3 December 2004, Rome. Italy. INAIL. Italian Workers Compensation Authority. Italian Workcover. Directorate of Communication. External Communication and International Relations Unit. Piazzale Giulio Pastore 6. I-0014 Rome RM, EUROPEAN UNION.

- Siirak, V. *Multi-media and the internet as educational tools for solving the problems of ergonomics and safety*, In: Human Factors in Transportation, Communication, Health and the Workplace. Shaker Publishing, The Netherlands, 2002. pp. 471-472. ISBN 90-423-0206-2.
- Siirak, V. *Experience of new teaching strategies of occupational health and ergonomics at Tallinn Technical University*. In: Best Practices in Occupational Safety and Health, Education, Training and Communication: Ideas That Sizzle. Proceedings of 6th International Conference Scientific Committee on Education and Training in Occupational Health, ICOH, October 28-30, 2002, Baltimore, Maryland, USA, pp. 224-226.
- Siirak, V. *Computer Based Learning as an Effective Tool for Prevention of Chemical Risks* - CD ROM: 8th International Symposium of ISSA Research Section, Athens (Greece) 19-23 May 2003. E.L.I.N.Y.A.E. (Hellenic Institute for Occupational Health and Safety) ISSA Research Section Symposium 2003.
- Siirak, V. *Some experience of computer based learning in OHS education for future engineers* In: ICIE 2005 1st International Conference on Interdisciplinarity in Education 17-19 April 2005, Athens. Greece Book of Abstracts. p.31.
- Stubbs, M., and Martin, I., *Blended Learning One Small Step*, Learning and Teaching in Action 2(3), 2003.
- Staley, A., *Students' Perspectives of Moodle*, Digital Future: The Newsletter of the Learning Technology Development Unit 2; 2-3, 2005.
- Strategic plan of Tallinn University of Technology 2006-2010.
- Tint, P., Siirak, V., *Computer-based learning in Occupational Safety and Health and health problems with computer use*. In: D.de Waard, C. Weikert, J. Hoonhout, J. Ramaekers (Eds) Human-System Interaction: Research and Application in the 21st Century, The Netherlands: Shaker Publishing, 2000. Pp. 107-109. ISBN 90-423-0126-0.