

# The Ergonetti - Web-Based Ergonomics Studies: A Qualitative Case Study

Marja Pitkänen<sup>\*1</sup>, Paula Naumanen<sup>2</sup>, Kari Ojanen<sup>2</sup> and Veikko Louhevaara<sup>\*1</sup>

<sup>1</sup>*Institute of Biomedicine, Physiology, Ergonomics, University of Kuopio, P.O. Box 1627, FI-70211 Kuopio, Finland*

<sup>2</sup>*Finnish Institute of Occupational Health, P.O. Box 73, FI-70701 Kuopio, Finland*

**Abstract:** The Ergonetti is a Finnish web-based university-level instructional learning program about ergonomics and workplace health promotion. The Ergonetti program is open to all applicants and it is intended to serve the needs of commercial enterprises. The aim of this study was to evaluate the Ergonetti program. Its evaluation was based on the experiences of the participants in the Ergonetti program including students (n=7) and their work colleagues (n=18). Their experiences were collected using theme interviews. The qualitative data were analyzed with the inductive content analysis. The student participants were well-motivated to use the Ergonetti program which was considered to have a high quality of substance and technical usability. On other hand, the lack of time both at work and at home hindered learning motivation of the student participants. They implemented their learning tasks in the close collaboration with their work colleague participants. At workplaces, discussions about difficult problems increased the positive interaction of all personnel groups. The present results showed that the Ergonetti program was good in terms of substance content, technical quality and usability, and support the development and use of interactive and full-time web-based learning courses and programs. The results of this study can be utilized for advancing and evaluating actions of educational workplace health promotion and improving the Ergonetti program. The amount of the present qualitative data was adequate but the generalization of the results may be limited due to small numbers of different enterprises in the study.

**Keywords:** Ergonomics studies, Ergonetti program, learning by experiences, web-based learning, on-the-job learning, workplace health promotion.

## INTRODUCTION

### Ergonomics

The nature of work in many countries is changing as a result of the increase in the use of new technology, and in knowledge-based industries [1]: workers are more sedentary and more isolated, which in turn leads to more musculoskeletal disorders and diseases, and psychosocial problems such as stress, anxiety and depression. New strategies and solutions are needed for controlling both conventional and novel risks [2]. Ergonomics represents one potential solution [3, 4]. Ergonomics is linked closely to the development of products, the maintenance and promotion of health, work ability and wellbeing through the reduction of safety risks and load factors at work. It can help in the primary prevention of work-related overload, symptoms and illness. It also has an important role in fitting work tasks for differently abled people [5].

Universities in many countries all over the world have offered degree courses in ergonomics for many years [6]. In Finland, ergonomics as a main subject has been available since 1996 at the University of Kuopio. Lower level ergonomics courses are also offered in some vocational and upper secondary schools, and polytechnics [7]. The University

of Kuopio is the only university in Finland which offers Bachelor, Master and Doctoral level education in ergonomics [8].

### Ergonomics at the University of Kuopio

Every Finnish university has an Open University, with courses available to all, regardless of age, educational aims or previous schooling [9]. The Open University at the University of Kuopio offers basic studies and more advanced studies (subject studies) in ergonomics [8]. After completing these studies, students may apply to study for the Bachelor's or Master's degree at the University of Kuopio.

The studies in ergonomics follow the criteria stipulated by the Certification of Registered European Ergonomist [10]. The courses in ergonomics are based on a psychophysiological approach and the studies include courses related to occupational health and wellbeing, the work environment, the work community and professional competence [8]. The courses are often linked to web-based learning, and face-to-face teaching and the web complement each other. However, the basic studies in ergonomics can only be carried out in the web using the Ergonetti program [11].

### Web-Based Learning

Web-based learning programs in different disciplines are becoming more common everywhere [12]. Web-based, time- and place-independent distance learning may replace traditional classroom teaching [13, 14]. Flexibility regarding time and place is one of the most often reported positive features of web-based learning [13-15]. It has been reported that the

\*Address correspondence to these authors at the (MP) Institute of Biomedicine, Physiology, Ergonomics, University of Kuopio, P.O. Box 1627, FI-70211, Kuopio, Finland; Tel: +358 40 3553 051; Fax: +358 17 162 214; E-mail: marja.pitkanen@uku.fi; and (VL) Fax: +358 17 162 214; E-mail: veikko.louhevaara@uku.fi

students favored we-based courses because of the convenience and flexibility in terms of place and pace. Flexibility is also needed because students may live far from the site of learning. The students need clear guidelines and instructions about when and how often they are expected to communicate with each other and with a tutor or teacher [13]. Students also feel isolated because of the absence of timely feedback and regular interaction [15]. A common structure across all web courses would be helpful to students and the interaction of high technical and substance quality between the tutor and students is essential for successful learning. Also the materials of web courses have to support goals of the course. The students responded that they learn more from online than face-to-face courses. However, students with more experience were dissatisfied with the technical environment and support provided with web-based courses [14]. Web-based learning goals and activities should be clear and informative, and linked to the students' needs [15, 16].

Learning by doing has been suggested to be the most efficient way to manage online studies. Almost all students were satisfied with the courses but both students and teachers needed training before they became accustomed and benefited from the web-based learning environment. Moreover, the planning and running of courses entails a major input of time and effort from tutors or teachers [17]. Teacher's role in web-based courses has changed from being a lecturer to being a counselor, and furthermore students are no passive objects but active subjects and participants [12].

Clearly, then, web-based learning has both benefits and disadvantages. Generally, the students were satisfied but, the technical environment and support of the tutors for instance need to be further developed.

The Ergonetti program used at the Open University in Kuopio is unique because the instructions, help of tutors, learning materials and learning tasks are only available on web.

### **The Ergonetti Program**

The Ergonetti is the name of the basic level learning program in ergonomics at the Open University in Kuopio. Altogether 1 376 students have participated in the Ergonetti program since its inauguration in 2000. About one third of them (412 students) have completed their studies and been awarded with the basic diploma in ergonomics.

The first web-based Ergonetti program, worth 28 ECTS (European Credit Transfer System) credit points, was developed in 1998-2000 at the Open University [18]. Finnish specialists and teachers of ergonomics and occupational health and safety participated in its development. The aim of the program is to enable students to learn how to improve, both in theory and practice, the health and wellbeing at their workplaces in a multidisciplinary manner. The web provides a technical learning environment, and the students apply the theory to the practice at their workplace. A second updated version of the Ergonetti program was launched in 2004 on the basis of the results and experiences gained during the use of the first version. The second version focuses on training and improving ergonomics and individual work capacity at the students' workplaces, mostly in small-scale enterprises. Several major improvements were made: the number of ex-

ercises was increased; the virtual environment was made more students friendly to alleviate the communication barriers between students and tutors on the web.

The theoretical framework behind the Ergonetti program has been influenced by the Finnish concept of workplace health promotion [19] (Fig. 1), the theory of on-the-job learning [20] and Kolb's developmental cycle [21]. The Ergonetti is not limited to physical wellbeing but also considers professional competence and mental wellbeing, and issues related to the work environment. Thus, the learning modules of the Ergonetti focus on the individual worker, work and the work environment, the work organization and leadership, and professional competence. The promotion of health, work ability and wellbeing is considered to be a comprehensive and participatory process with concrete aims and logical processes. At actual workplaces, the personnel's different views and experiences are discussed and canvassed, and improvements are based on consensus. Continuous development is necessary when responding to rapid changes in working life (Fig. 1).

The Ergonetti program of 28 ECTS credits consists of following six modules: I. Keys for the development of work (4 credits), II. Diverse load at work (4 credits), III. Work environment (4 credits), IV. Work and individual (5 credits), V. Work community and competence (8 credits) and VI. Summary (3 credits) (Fig. 1).

The students of the Ergonetti identify and prioritize relevant problems at work which are needed to be improved in the first module. The problems are specified and measured in modules of II-V. In the final VI module, the students complete a summary of all exercises and developmental measures and analyze impacts of the changes. Each module follows Kolb's development cycle including four phases: identification, analysing, understanding and solving of the problems [21] (Fig. 2).

Educational exercises of the Ergonetti program are conducted at the student's workplace and the assistance of tutors is regularly available. A student works closely and continuously with his or her work colleagues during the learning process. A student receives continuous feedback from the tutors and also from specialists of occupational health and safety at the end of each module.

According to the previous studies of Piesanen [22, 23] and Ropponen and Louhevaara [24], the Ergonetti students have created tools for investigating their own work and work organisation, and have found practices to solve problems. The students identified objects where development activities were needed at their workplace, analyzed the relevant objects and solved problems. Piesanen [22, 23] also reported that the entrepreneurs though that discussions about difficult problems increased general occupational wellbeing. Furthermore, developmental projects were evaluated as being successful by designers since they had been able to combine working life and education. According to Ropponen and Louhevaara [24] the Ergonetti supports workplace health promotion activities, and produces actual and concrete improvements in working conditions, and they impact positively on learning experiences of the students.

The Ergonetti program is improved continuously based on regular evaluations. The aim of this qualitative study was

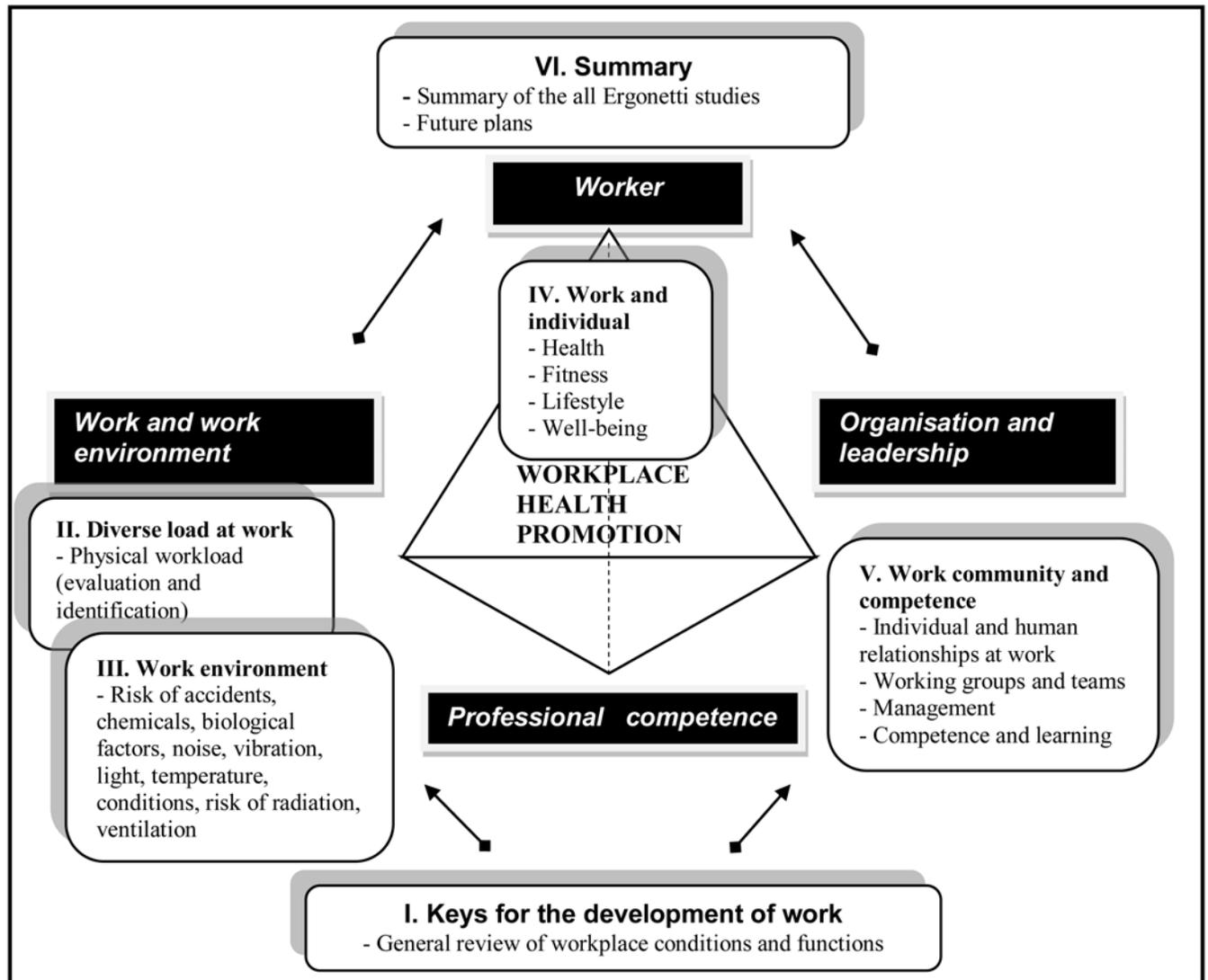


Fig. (1). The Ergonetti modules in the Finnish concept of workplace health promotion [19].

to evaluate the Ergonetti program by utilizing the experiences and feed-back of the students and their colleagues. The evaluation focused on the benefits and disadvantages of the Ergonetti program, and its role in solving problems collaboratively at workplaces.

## MATERIALS AND METHODOLOGY

### Data Collection and Participants

The data were compiled with theme interviews of seven individuals and six groups. The participants of the individual theme interviews were seven students (three men and four women) who completed the Ergonetti program in 2001 - 2003 during the development of the second Ergonetti. Workers from the students' workplaces (n=18, eight men and 10 women) were also treated as the participants in the group theme interviews, and 1-6 of them participated in each group interview. The student participants worked at their workplaces and studied in the Ergonetti program simultaneously. Two of the student participants worked at the same workplace but in different working groups. All participants worked in small-scale enterprises representing the furniture

industry, nursery gardening, clothing industry and service homes. The students and worker participants solved together problems at the workplace identified by the Ergonetti. The mean age of the participants was 41 (range 24-60) years and they had undergone at least vocational training at the junior high school level. One of them was a university graduate. Five of the student participants were experienced computer users and one had previously participated in web-based learning courses.

The themes of the student participants' interviews were their experiences, perceived benefits and disadvantages of the Ergonetti program and possible interactions between the students' personal characteristics and developmental processes within the Ergonetti. The interviews of the workers' participants included themes of benefits and disadvantages of the Ergonetti studies at the enterprise level and their experiences of solving problems in the collaboration with the student participants.

All the interviews were conducted, tape- and video-recorded and transcribed by a researcher (the first author). Video-recordings helped to identify the comments of the

group interview participants, and the transcription process afterwards. The interview themes were given to the participants beforehand. After the transcription the participants had possibility to make changes to it. The interviews were carried out at the workplace. For each individual theme interviews, an undisturbed room and 20-40 minutes of time was reserved. The group theme interviews were conducted in an undisturbed room within 60-70 minutes. The data was summarized into a document of 174 pages. The open themes were derived from the aims of the study.

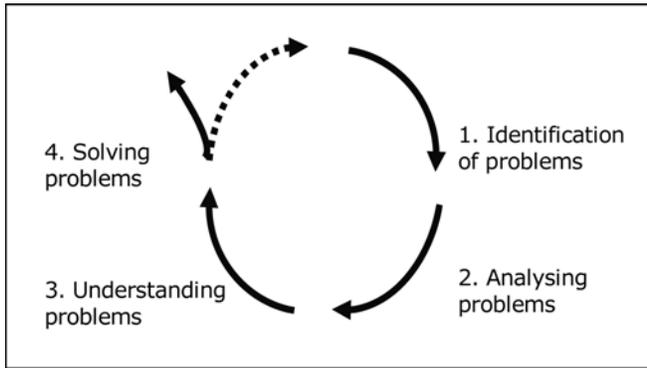


Fig. (2). Kolb's developmental cycle utilized in the Ergonetti [21].

### Methodological Issues and Data Analyzing

The methodological approach of the study was on-the-job learning [20], which roots are in the learning by experiences [21]. On-the-job learning is tied to the actual situation at the workplace. The student is an active participant and learns, for example, from own experiences building new knowledge upon his or her earlier experiences. Learning is also collaborative, and student learns from colleagues and with them. On-the-job learning is reflective and a student can transfer obtained skills to the new context [20].

The present data were analyzed using a qualitative induct content analysis which is a method for analyzing documents in a systematic and objective manner. The aim was to construct a model to describe the phenomenon in a conceptual form [25-28].

In this study, the individual and group interviews were analyzed together and the data were combined. The number of participants was small and, therefore, the differences due to age, gender or position were not analyzed but the data of the student and worker participants were differentiated. The results are given in main categories, categories and subcategories. The main categories are benefits and disadvantages of the Ergonetti program, and they both have three categories. The categories divided in several subcategories. The categories of the benefits were divided into three categories: enterprise, the Ergonetti program and individual students. The categories of the disadvantages were also divided into three categories: implementation, support and personal problems. In the results (Fig. 3), the values in the parenthesis after the all categories show the frequencies of how often certain quotations occurred in the original interviews. The researcher confirmed all categories several times and discussed them with the researcher group. The data were categorized by utilizing atlas.ti 5.0 Software of the Windows program [29]. The number of the interviews and the separation of interviews

(individual vs group) are given in the parenthesis after the authentic quotation.

The institutional approval was sought from the Finnish Institute of Occupational Health. The voluntary participants were informed about the study purpose and they had a possibility to withdraw their information any time. The anonymity of the participants and their enterprises were guaranteed by deleting the identification information in the analyzing and documenting phases of the data.

### RESULTS

The number of the beneficial comments was 229 and disadvantages 86 (Fig. 3). Few comments fitted to different subcategories.

The categories of benefits focused on the enterprise (n = 92), the Ergonetti program (n = 86), and the participants as individual students (n = 51). All quotations of the worker participants included the category 'enterprise'. The subcategory 'collaboration increased' received 28 worker and 7 student quotations. The corresponding values in the subcategories 'developmental process', 'attitudes changed to being more positive' and 'support was good' were: 17 and 2, 6 and 4, and 3 worker and 25 student quotations, respectively (Fig. 3).

In the enterprises, the collaboration of the workers increased and the attitudes of the managers and workers toward the developmental activities changed positively. The development projects at the workplaces driven by the Ergonetti program worked out well and followed the learning cycle of the Ergonetti. The positive attitude of the work colleagues and management supported studies of the student participants during working hours. Also open conversation gave an opportunity to discuss about various problematic issues. One student participant described that both in the individual and group interview as follows:

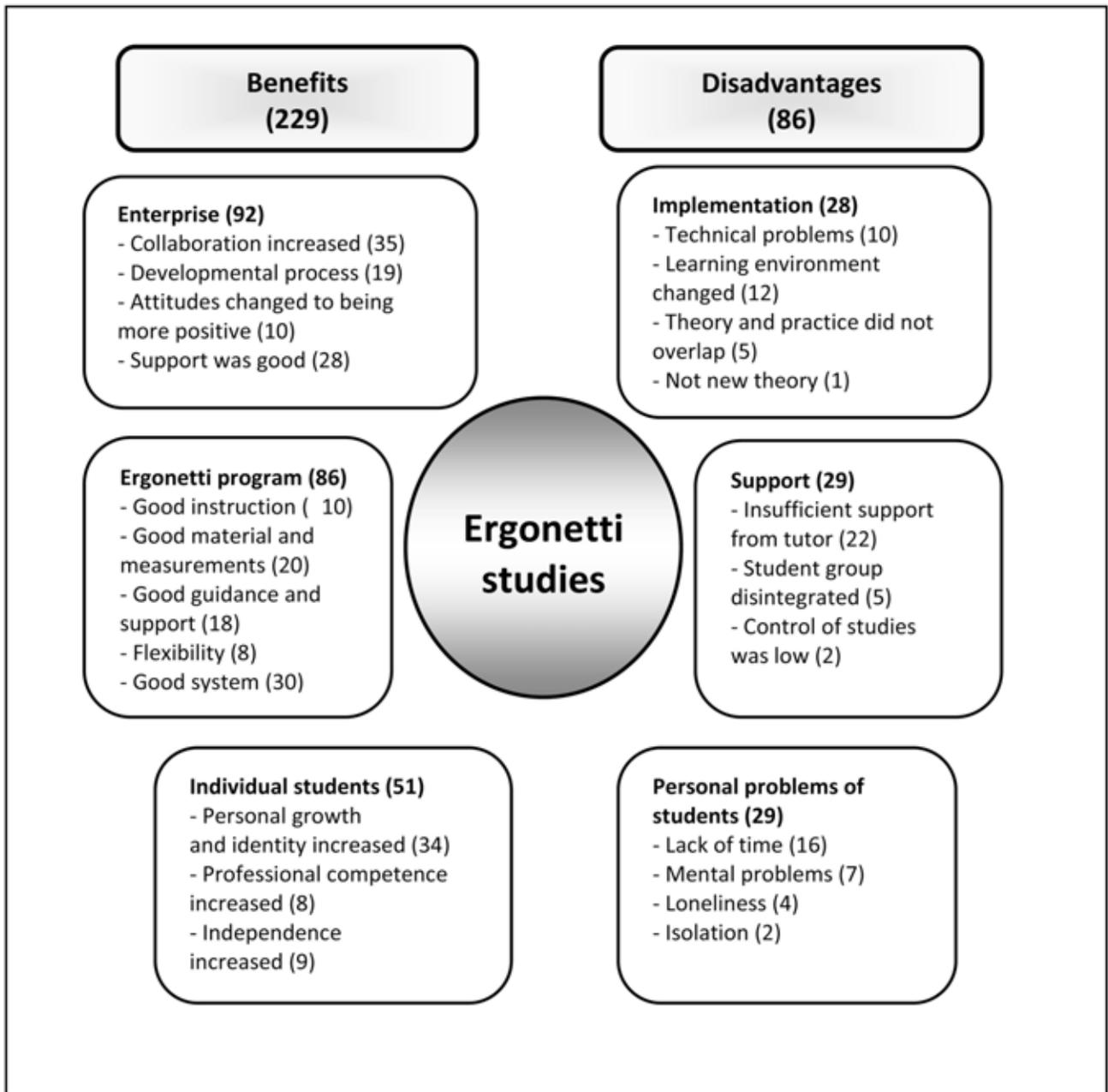
*'I had a wonderful work team; this team was a special resource during my Ergonetti studies, which I completed as a process. Also my employer was interested in my studies and this increased my motivation (I = interview 7, individual).'*

*'My work was facilitated enormously by having an open discussion group issuing direct statements which are also realistic but, as we have pointed out on several occasions, constructive rather than destructive'(I8, group).*

The Ergonetti program was considered good in terms of the instruction, guidelines, materials, and measurements, guidance of the tutors, support from other students and flexibility of studies. The Ergonetti was also considered a straightforward distance learning system provided via the web. The following comments illustrate the positive aspects of the Ergonetti studies:

*'This kind of studying fits very well into my daily routines. I can write on my computer even when I am sitting at the peak end of my jetty (I 1, individual).'*

*'There was one work phase which I felt was problematic and repetitive, with one unit with one employee. I began to look into it, the pos-*



**Fig. (3).** Benefits and disadvantages of the Ergonetti studies. The number of the quotations is given in the parenthesis.

*tural load and what kind of tools would be needed for this phase to make it less strenuous and repetitive, and how we might make it as easy as possible (I 2, individual)'.*

The Ergonetti studies developed personal growth, professional competence, personal identity, and the independence of fixed timetables. The following comments illustrate individual benefits:

*'Ergonetti means very much for me and one important aspect is important for me. I have understood how important it is to take care of myself. Nobody but me can take care of myself (I 5, individual)'.*

*'Ergonetti taught me a lot. Now I can also express myself in writing (I 3, individual)'.*

The status of the participants increased at the workplace, and contributed to the developmental process. The following comment reflects this view:

*'We have noticed that we are in the same boat, our collaboration has increased and we take care of each other (I 4, individual)'.*

The disadvantages were linked to problems associated with the use of the Ergonetti program ( $n = 28$ ), insufficient support of the tutors ( $n = 29$ ), and individual problems due to changes in situations of life ( $n = 29$ ). The worker participants mentioned no disadvantages.

The student participants had difficulties to adapt changes in the learning environment. There were also difficulties in the beginning of each new Ergonetti module and converting theories to practical measures at the workplace.

*'At the beginning the learning environment was in Finnish, but later it changed partly into English. I thought that now I will drop out of this program (I 5, individual).'*

The counselling of the tutors and the support of other students were often considered poor, the student groups were disintegrated, and the control of studies was low. The following comments reflect dissatisfaction with the support:

*'I didn't get enough personal support from my tutor and other students. I needed more individual conversational support (I 3, individual).'*

*'It would be better if all students were studying side by side in each module I didn't get support from other students and that's why I felt myself quite isolated (I 5, individual).'*

There were also individual problems such as the lack of time, mental problems, loneliness and the feeling of isolation due to distance learning. The following comment illustrates this view:

*'Controlling the use of my time is a problem when I have no need to study at any fixed place. The use of time depends only on me (I 6, individual).'*

## DISCUSSION

### On-the-Job Learning with the Ergonetti

The main aim of this study was to evaluate the Ergonetti program but also present its content and theoretical basis. The practical implementation of the Ergonetti program increased discussions about difficult problems and the collaboration between all workplace partners and lead to improvements in working conditions. The developmental process according to the learning cycle demanded participatory approach. The idea of learning by experiences [21] and on-the-job-learning [20] were worked out well among the student participants. Also all quotations of the worker participants showed that the developmental process of the Ergonetti functioned well and increased collaboration at the workplace. The present results were similar to those reported by Piisanen [22, 23] and Ropponen and Louhevaara [24]. The Ergonetti students were well-motivated. Their work colleagues and management were also committed and participated in developing projects and supported learning and the implementation of the program.

This study focused on the discipline in ergonomics when most previous studies have dealt with general web-based learning. The present main results agreed with those of Aggarwal [12], Young and Norgard [14] and Yu and Yang [15]. They showed that the web-based courses were convenient, and offered flexibility for most of the adult students. The Ergonetti students reported that technical problems were common and the navigation in the web was difficult in the beginning of their studies and phases of change in the learning environment. The students completed their learning tasks successfully when the technical construction of the modules

and learning environment remained unchanged and became familiar. Tutors should alleviate stress due to technical problems by giving students early information on possible problems. The students could prevent many of the problems by doing, for instance, back-up plans and copies [16].

The lack of spare time at work and free time at home decreased the motivation to study with the Ergonetti. Similar problems have reported previous [13, 14]. It is an obvious reality that working is the most important, and studying is secondary. This kind of thinking and rating can be criticized according to the current education trends. They emphasize the necessity of on-the-job-learning [20].

The web-based studies are intended to encourage independent learning. However, clearly some students needed more individual guidance and instruction than the tutors of the Ergonetti could offer. Appropriate guidance is a challenge for the tutors and they have to be regularly available. Usually the tutors are M.Sc. students in ergonomics at the University of Kuopio or the specialists in the field of occupational health and safety. Learning within the program needs to be developed more individualized and independent. The tutors should provide accurate and understandable feedback when they read and correct exercises. It is recommended that the tutors familiarize themselves with web-based pedagogy that they can motivate and encourage students as well as develop their own skills for giving feedback. A student needs to have own personal curriculum for each module of the Ergonetti [16] that would also allow the close following of progress of students by tutors. The students' feelings of isolation could be prevented by exact and regular information from tutors [15].

In the web-based learning programs without face-to-face teaching occasions like the Ergonetti the role of tutors is essential. The third phase of the Ergonetti cycle (understanding the problems) is the critical one. Students have to implement learned theories to practical measures at the workplace. The competence of tutors for giving guidance and support is on trial. Yu and Yang [15] reported similar results and concluded correspondingly.

### Methodological Considerations

Almost all present student participants were in managerial positions i.e., so-called white-collar workers. They could implement developmental measures into daily good practices in their enterprises quite easily and this may decrease the reliability of the present results. Their experiences related to the Ergonetti might be more positive than those students who belong to 'blue-collar' workers.

The results showed that there was more benefit than disadvantage categories. The content of both categories was as valuable for the developmental work of the Ergonetti program in spite of quantitative differences between the categories. The implementations of the results may be difficult due to small numbers of different enterprises. Therefore, all relevant quotations were included the analysis. The principal problem of the qualitative content analysis is the adequate data-reduction in the analyzing process [25]. However, the material of this study was large enough and the use of low inference descriptors in field notes and careful repeated auditing with the help of the research group increased the qualitative power of this study [30].

The participants had the opportunity to comment and make changes to their interviews. The data was transported into the qualitative software of atlas.ti, and this increased the reliability of the study [28]. The coding rules were always applied in the equal way. The atlas.ti program proved to be very suitable for this study. Direct quotations from the interviews made the text more interesting but translating the text into English was laborious because the participants used colloquial Finnish language.

Exclusively web-based learning courses and programs are still not very common. Usually web-based and face-to-face teaching and learning complements each other. Instructions and background materials are often distributed over the web but teaching is mostly carried out in the classroom. After the face-to-face teaching, discussion continues in the web when the students have completed their exercises.

### Practical Implementation of the Present Results

The following two examples describe the workplace implementation of the Ergonetti program. The examples based on the present data and have published on web-pages of the Finnish Institute of Occupational Health [31].

#### EXAMPLE 1: REDUCING THE WORKLOAD OF THE SEEDING AND FILLING LINE (NURSERY GARDEN)

“Work in a nursery garden is seasonal, the busiest times being the spring and summer. An Ergonetti student studied the workload of an employee at a nursery garden’s seeding and filling line during the Ergonetti module, “Diverse loads at work,” by videotaping the work, measuring the speed of the conveyor belt for the seeding and filling line and counting how many seeding boxes the employee picked up per minute/hour. One person at a time works on the nursery garden’s seeding and filling line, and the work takes about five weeks in the spring and summer. The upper extremities of seeding line employees are burdened by repetitive work while their backs suffer from working in a twisted position. By nature, this work is performed standing up and at a forced pace, and it is monotonous. The conveyor belt delivers approximately 12 packing boxes per minute, and the employee shifts the boxes from the seeding and filling line to a large pad for the further treatment of the plants.

The Ergonetti student presented the results of the survey to the employees at a workplace meeting and, on a larger scale, to the company’s management and other employees at a joint development event. To ease the workload, specific work instructions were drawn up for the seeding and filling line. The Ergonetti student instructed the employees on better working positions. Attention was also paid to the cleanliness of the working environment and e.g. trash was removed immediately. To ease standing work, rubber carpets and new shoes were acquired for the employees. Occupational safety with respect to employees’ hands was improved by acquiring thin, non-slippery protective gloves of the right size. Job rotation eased the monotonous aspect.

These measures helped to prevent fatigue and repetitive strain injuries caused by the repetitive nature of the work. The employees found their work meaningful, and the quality of the plants improved while costs were minimal. In a modified form, these measures can be transferred to other types of repetitive work.”

#### EXAMPLE 2: INCREASING ATTENTION PAID TO ERGONOMICS (SERVICE HOME)

“During the Ergonetti program, several development projects were carried out simultaneously in one service home. The working environment was improved, a customer satisfaction questionnaire was drawn up and jobs were made permanent. Before the Ergonetti, it was known that working at the service home was physically and mentally tough, but during the Ergonetti survey it became clear, surprisingly enough, that the mental stress was greater than the physical strain.

When the Ergonetti survey results were discussed in the workplace, the employees observed that the targets at which the work was directed, i.e. the residents, governed their working environment and conditions. During the Ergonetti, the co-operation required between residents and family members was made clear. This measure clearly decreased the anxiety that the employees had previously felt about such co-operation.

Ergonetti’s development operating model (seeking solutions through an analysis and understanding of the problems) has become a permanent framework for development work at the service home. It has also proven adaptable to the other homes run by the same company. The Ergonetti student has been appointed ergonomics expert in the joint occupational safety committee covering the entire service home group, and an internal ergonomics project has likewise been launched under the supervision of the committee. The aim of the project is to construct wellbeing at work programmed which will clarify, for example, how the handling of daily routines can be improved and how the employees can handle their work both physically and mentally.

Through her own actions, the Ergonetti student has “taught” her skills in ergonomics to the other staff and thus created continuity for the workplace development work. Because the Ergonetti development work has preceded one step at a time, it has expanded into broad-ranging work on improving occupational wellbeing within the service home. The employees have occasionally become tired of continuously development, but have still approached innovations with curiosity, courage and interest. Joint, regular discussions on workplace issues have been perceived as an unquestionable resource.”

### CONCLUSIONS

The Ergonetti program is an efficient web-based learning environment suitable for working adults. It plays an important role in the basic degree studies in ergonomics at the University of Kuopio. It is available for all applicants and is targeted to serve the developmental needs of enterprises and organizations, particularly, small-scale enterprises.

The results of the present evaluation support the investment time and resources in creating interactive and full-time web-based courses in different disciplines. The developmental learning cycle of the Ergonetti can be applied to other fields demanding problem solving based on personal experiences and on-the-job-learning.

The results of this study can be used for development work in ergonomics studies at the University of Kuopio. In the future, should be collected evaluation data of the Ergon-

etti from different kinds of enterprises (small-, medium- and large-sized) and differences between them should be analyzed. The ways that developmental processes differ due to the Ergonetti program should be precisely described.

## ACKNOWLEDGEMENT

The Finnish Ministry of Education, the Finnish Ministry of Labour and the European Social Fund have funded both Ergonetti programs and this study.

## REFERENCES

- [1] Burke RJ, Ng E. The changing nature of work and organizations: Implications for human resource management. *Hum Resour Manage Rev* 2006; 16: 86-94.
- [2] European Agency for Safety and Health. European Agency for Safety and Health at Work. Priorities for occupational safety and health research in the EU-25, 2005.
- [3] International Labour Office. Global strategy on occupational safety and health. Conclusions adopted by the International Labour Conference at its 91st Session, 2003. Retrieved 2007, May 23 from: [http://www.ilo.org/public/english/protection/safework/globstrat\\_e.pdf](http://www.ilo.org/public/english/protection/safework/globstrat_e.pdf)
- [4] International Labour Office. Guide to International Labour Standards. International Labour Standards Department, 2006. Retrieved 2007, May 23 from: [http://www.ilo.org/wcmsp5/groups/public/---ed\\_norm/---normes/documents/publication/wcms\\_086223.pdf](http://www.ilo.org/wcmsp5/groups/public/---ed_norm/---normes/documents/publication/wcms_086223.pdf)
- [5] Finnish Ministry of Social Affairs and Health. Research on Well-Being at Work in Finland - Focusing on Occupational Health and Safety 2005; 25.
- [6] International Ergonomics Association. Study Ergonomics. Retrieved 2007, May 23 from: [http://www.iea.cc/browse.php?contID=study\\_ergonomics](http://www.iea.cc/browse.php?contID=study_ergonomics)
- [7] Kantolahti T, Juvas K. Education of Ergonomics in Finland. The Finnish Ergonomics Society 2004.
- [8] University of Kuopio. Education. 2008; Retrieved 2007, May 20 from: <http://www.uku.fi/english/education.shtml>
- [9] Information on all Open University courses in Finland. Retrieved 2008, Oct 1 from: <http://www.avoinyliopisto.fi/en-GB/>
- [10] Centre for Registration of European Ergonomists - CREE. About CREE. Retrieved 2007, Sep 3 from: <http://www.eurerg.org/aboutCREE.htm>
- [11] Ergonetti. Ergonomian ja työhyvinvoinnin opintokokonaisuus verkossa. 2008; Retrieved 2007, Sep 23 from: <http://www.uku.fi/ergonetti>
- [12] Aggarwal AK. A Guide to eCourse Management: The Stakeholders' Perspectives. In: Aggarwal AK, Eds. Web-based education: Learning from experience 2003, pp. 1-23.
- [13] Clulow V, Govan-Brace J. Web-based learning: Experience-Based Research. In: Aggarwal AK, Ed. Web-based education: Learning from experience 2003; pp. 49-70.
- [14] Young A, Norgard C. Assessing the quality of online courses from the students' perspective. *Internet Higher Educ* 2006; 9: 107-15.
- [15] Yu S, Yang K-F. Attitudes toward web-based distance learning among public health nurses in Taiwan: A questionnaire survey. *Int J Nurs Stud* 2006; 43: 767-74.
- [16] Song L, Singleton ES, Hill JR, Koh MH. Improving online learning: Student perceptions of useful and challenging characteristics. *Internet Higher Educ* 2004; 7: 59-70.
- [17] Lammintakanen J, Rissanen S. An Evaluation of Web-Based Education at a Finnish University. In: Aggarwal AK, Ed. Web-based education: Learning from experience 2003; pp. 440-53.
- [18] Louhevaara V, Saaranen T, Ritvanen U, Toivanen H, Pääkkönen A, Ropponen A. Ergonetti – University-level studies of basic ergonomics through the Internet: Proceedings of the International Ergonomics Association 25th Triennial Congress, Seoul, Korea; 2003.
- [19] Finnish Institute of Occupational Health. Promoting a healthy workplace. 2008; Retrieved 2007, Sep 3 from: <http://www.ttl.fi/internet/english>
- [20] Pohjonen E. On-The-Job Learning in Finland. The Education System under the National Board of Education. National Board of Education ed. Helsinki, Finland: Printing Hakapaino Oy; 2002.
- [21] Kolb DA. *Experiential learning : experience as the source of learning and development.* Prentice-Hall: Englewood Cliffs (NJ); 1984.
- [22] Piesanen E. Collaboration between Higher Education and Enterprises: Ergonomics Studies for Employees to Enhance Skills, Job Satisfaction and Profitability: Proceedings of the EAN 12<sup>th</sup> Annual Conference, Prague, Czech Republic, 2003.
- [23] Piesanen E. Higher Education and Working Life: Open University studies as Company Personnel Training: Proceedings of the EAIR 25<sup>th</sup> Annual Forum on Building Bridges and Enhancing Experience, Limerick, Ireland; 2003.
- [24] Ropponen A, Louhevaara V. Learning experiences and satisfaction with the internet study program "Basis of ergonomics and workplace health promotion – Ergonetti": Proceedings of the Nordic Ergonomics Society (NES) 38th Conference, Hämeenlinna, Finland; 2006.
- [25] Weber P. *Basic Content Analysis.* Beverly Hills, London, New Delhi: Sage; 1985.
- [26] Krippendorff K. *Content Analysis. An Introduction to Its Methodology.* 2<sup>nd</sup> ed. Beverly Hills, London: Thousand Oaks, CA: Sage; 2004.
- [27] Manning P, Cullum-Swan B. Narrative, Content, and Semiotic Analysis. In: Denzin N, Lincoln Y, Eds. *Handbook of Qualitative Research* 1994; pp. 463-77.
- [28] Huberman AM, Miles MB. Data management and analysis methods. In: Denzin N, Lincoln Y, Eds. *Handbook of Qualitative Research* 1994; pp. 428-44.
- [29] atlas.ti. 2008; Retrieved 2007, May 30 from Available at: <http://www.atlasti.com/>
- [30] Polit D, Hungler B. *Nursing research. Methods, Appraisal, and Utilization.* United States of America: J B Lippincott Company, 1993.
- [31] Good Practices in the Workplace. 2007; Retrieved 2008, Sep 27 from: <http://www.ttl.fi/Internet/English/Thematic+pages/Ergonomics/Good+practices+in+the+workplace/>

Received: June 20, 2008

Revised: October 14, 2008

Accepted: October 16, 2008

© Pitkänen et al.; Licensee Bentham Open.

This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.