

## Towards sustainable well-being in SMEs through the web-based learning program of ergonomics

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**Abstract** Promoting well-being at work in the context of sustainable development is a complex and dynamic issue. To enhance sustainable well-being at work, organizational learning (OL) is one requirement. The purpose of this study was to identify and describe the characteristics of the learning program of the ergonomics ‘the Ergonetti’ that promote sustainable well-being at work implemented in the small- and medium-sized enterprises (SMEs). The data was gathered through individual thematic interviews of 14 students who participated in the study and carried out the learning tasks in 10 different SMEs. The data was analyzed using inductive content analysis in the frame of sustainable well-being at work and organizational learning. The characteristics of the learning program of ergonomics that promoted sustainable well-being at work related to the categories describing worker’s individual capabilities and competence, work organization and environment, and leadership. The results suggest that, in the light of promoting sustainable

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well-being at work the learning program of ergonomics may be considered an efficient and straightforward distance learning program accessible through the Internet. In addition, sustainable well-being at work through learning is rarely being in focus of occupational health research.

**Keywords** Well-being at work · Sustainable development · Web-based learning · Organizational learning · SMEs · Content analysis

## 1 Introduction

The promotion of well-being at work in the framework of sustainable development can be seen as a challenge and opportunity for organizations and all their partners, for example customers and stakeholders to achieve goals such as a “healthy working place without depleting natural resources” and “the ability of future generations to meet their needs” (United Nations Conference on Environment and Development 1992; World Health Organization 1994). The promotion of well-being at work is multidimensional and can be depicted through activities that require both strengthening of a worker’s individual resources, including professional competence, and the developing of the content of work as well as the working environment which includes physical and psycho-social aspects (Ilmarinen 2006). Promoting well-being at work in the context of sustainable development is a complex and dynamic issue (Fresner and Engelhardt 2004; Hasle and Jensen 2006; Oerlemans and Assouline 2004). To enhance sustainable well-being at work, new and innovative thinking, adopted through organizational learning (OL), is a requirement (Helmfrid et al. 2008; Pitkänen and Louhevaara 2009; Sarmalisto and Brorson 2008; Siebenhüner and Arnold 2007; Soini et al. 2003; Störmer 2008). Scott (2008) also suggests that the key activities which promote sustainable development at work are associated with the learning of ergonomics. The multidisciplinary science of ergonomics aims to increase well-being at work (Scott 2008). Thus, potential solutions or options to promote well-being at work may rise from the learning of ergonomics (Pitkänen et al. 2008).

Small- and medium-sized enterprises (SMEs) are a heterogeneous group of companies (Saru 2007) that have less resources, time, money, skills, and knowledge to promote sustainable development and sustainable well-being at work than large companies. However, the new economic and ecologic thinking demands SMEs to invest time and resources for the promotion of their work and business towards sustainable development (Crals and Vereeck 2005). Promoting sustainable well-being at work through OL has scarcely been the focus of empirical research.

## 2 Sustainable well-being at work in the context of organizational learning

### 2.1 Organizational learning

Organizational learning (OL) can be seen as a primary tool used by organizations or the working life in general for develop work since it has been argued that knowledge

is to become the most important asset of human capital. Today, competent workers are indispensable and a valuable resource for organizations (Saru 2007).

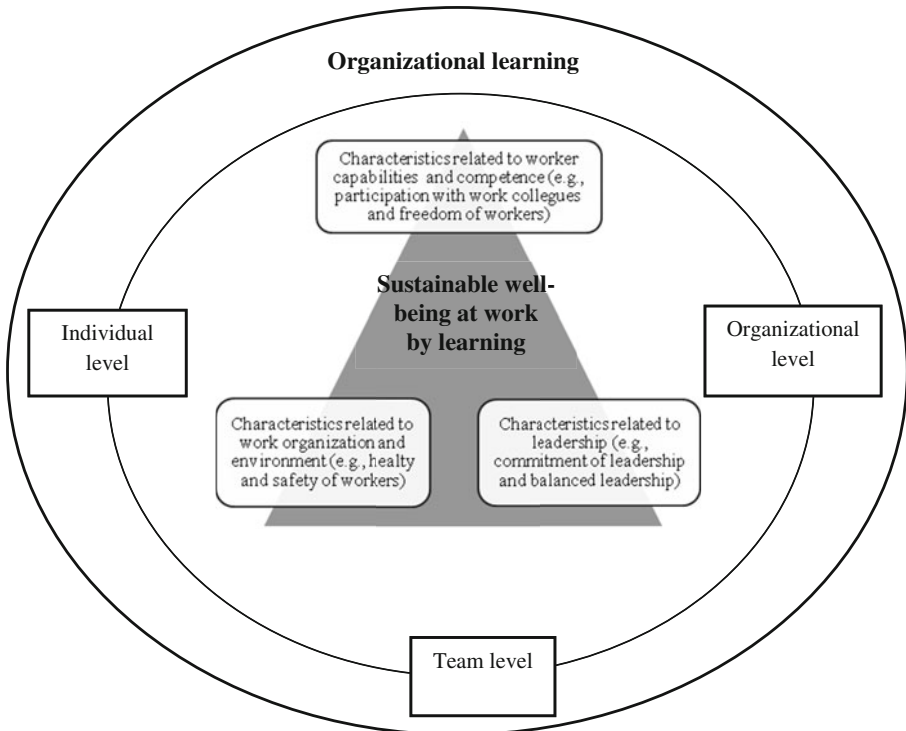
OL can be realized on an individual, team, and organizational level (Bucic et al. 2010). Individuals can learn in informal (on-the-job) and formal (school) ways (Soini et al. 2003). OL should be seen as a process where the knowledge of each individual increases and can be hence implemented to the knowledge base of the organization. If the culture of an organization is not workable, but rather hierarchical and rigid, and knowledge is not being shared among individuals and groups, the impacts of OL on organizational effectiveness seemed to remain scarce (Dyck et al. 2005; Nonaka and Takeuchi 1995). Therefore, sharing of knowledge is essential in OL. It also enhances the creativity of organizations through the collaboration of individuals and their capacity to innovate (Alegre and Chiva 2008; Ipe 2003; Reyhav and Weisberg 2009). According to Molnar and Mulvihill (2003), OL that focuses on sustainability is also a team learning process where organizations engage in sustainable development.

Organizational knowledge can be explicit and tacit. The content of explicit knowledge consists of formal rules, tools, and processes which make it easier to transfer and share. Tacit knowledge is intuitive and unarticulated. It is something what we know, also described as know how, but cannot explain. Therefore, tacit knowledge is difficult to transfer and share. However, shared tacit knowledge would be vital to ongoing development of organization (Becerra et al. 2008; De Long and Fahey 2000; Dyck et al. 2005; Reyhav and Weisberg 2009). According to Saru (2007), communication between junior and senior workers helps new workers to acquire tacit knowledge, and to pick up the culture and habits of the organization. Moreover, OL and development of human resources are important measures used to increase economic and competitiveness status of SMEs. Formal control systems and need for documentation are low in SMEs because of the close relationship between the managers and the workers. The managers may directly influence each worker's activities and also their impact on performance and productivity is clearer than in large organizations (Saru 2007).

## 2.2 Promotion of sustainable well-being at work by learning

Based on the analyzed literature which are presented in following three chapters 'promotion of sustainable well-being at work by learning' has been identified characteristics related: (1) to the promotion of a worker's capabilities and competence, (2) to the promotion of work organization and environment, and (3) to the promotion of leadership (Fig. 1).

The promotion of a worker's capabilities and competence by learning in the context of sustainable development demands an active collaboration between work colleagues (Fresner and Engelhardt 2004; Oerlemans and Assouline 2004; Sammalisto and Brorson 2008), an active reflection on new information together with other workers (Hasle and Jensen 2006), and a voluntary participation to the training program as it guides the learning process better than if the participation was to be compulsory (Helmfrid et al. 2008; Sammalisto and Brorson 2008). Through collaborative training in real working situations, workers could share their earlier experiences and create information on sustainable development. This would also



**Fig. 1** Sustainable well-being at work in the context of organizational learning

improve their well-being at work (Helmfrid et al. 2008; Koplin et al. 2007; Oerlemans and Assouline 2004; Sammalisto and Brorson 2008; Wu and Pretty 2004). Effective collaboration on projects of sustainable developmental seemed to reduce costs and allowed the continuation of developmental projects (Fresner and Engelhardt 2004).

The promotion of work organization and environment by learning in the context of sustainable development requires active and conscious changes in the goals and values of the organizations (Hasle and Jensen 2006; Jones 1999). These changes were usually attained with help and participation of researchers who guided the learning processes (Fresner and Engelhardt 2004; Helmfrid et al. 2008; Koplin et al. 2007; Oerlemans and Assouline 2004; Sammalisto and Brorson 2008; Störmer 2008). Due to their help, the organizations noticed that slow implementation by using small steps and enhancing common understanding between all working partners was more efficient than trying to solve problems immediately (Fresner and Engelhardt 2004). Also, the collaboration with close stakeholders and customers during the learning process seemed to develop work organizations and environments towards a more sustainable direction (Fresner and Engelhardt 2004; Helmfrid et al. 2008; Koplin et al. 2007).

The promotion of leadership skills by learning in the context of sustainable development requires a commitment from the managers and true leadership skills. After the learning process, the implementation of sustainable development requires

changes in the values of organization and its working culture. The entire personnel must accept these changes and commit to them and the leading manager should be involved in the process as his or hers support is important (Oerlemans and Assouline 2004; Perron et al. 2006; Remmen and Lorentzen 2000). According to Oerlemans and Assouline (2004), the managers found that developmental work in the collaboration with the workers was effective and produced positive changes in the organization. Regulations created in cooperation also seemed to help both managers and workers to complete their duties (Seppänen 2002).

### 2.3 The learning program of ergonomics

Current information and communication technology allows organizations to achieve, process, store, and exchange information, for instance, on the Internet (Cegarra-Navarro et al. 2007). The Internet also works as an effective tool or system that enables distance teaching and learning, and as a means to share acquired knowledge and experience on workplaces (Barratt 2006; Pitkänen et al. 2008). Distance teaching and learning is also economic and energy efficient which are two important elements of sustainable development (Barratt 2006).

The learning program of ergonomics titled ‘The Ergonetti’ is a web-based and basic level ergonomics program and that consist of 25 study credit points at the University of Eastern Finland. The program is offered in Finnish language but the web-based learning environment is available all over the world through the Internet (Ergonetti 2011). The theoretical framework behind the program is based on the Finnish concept of workplace health promotion (e.g., Ilmarinen 2006), the theory of on-the-job learning (e.g., Pohjonen 2002), and Kolb’s developmental cycle (Kolb 1984). The learning program supports and aims to increase activities that promote well-being at work within four dimensions: (1) Worker capabilities, (2) Professional competence, (3) Work and work environment, and (4) Organization and leadership. The learning tasks of the program consist of various developmental activities which are carried out at actual workplaces where the personnel’s different views and experiences are discussed, and improvements are based on consensus (Pitkänen et al. 2008). Therefore, the learning tasks are tied to the context of real work. Learning is cyclic having phases to measure, analyze, understand, and solve problems within close collaboration between workers and managers who also learn alongside with the student. Previously, the learning program has shown to be an efficient learning tool that provides a way to identify, understand, and solve problems in terms of economy, advantage in costs, production, and quality (Pitkänen et al. 2008; Ropponen 2009). Pitkänen et al. (2008) also reported that the students from SMEs considered the program to be beneficial due to positive attitude changes of managers and work colleagues, increased collaboration between workers, and the possibility to open conversations concerning difficult problems between all partners within a workplace.

In this study, this learning program of ergonomics is suggested to act as a “catalyst” at workplace to enhance OL at the individual, team, and organizational level in the context of sustainable well-being at work (Fig. 1). The program requires processes of interaction, sharing, and reflection at the workplace. Individual learning

through the program feeds learning at the team and organizational levels and improves measurable organizational actions, routines, and practices.

### 3 The purpose of the study

The purpose of this study was to identify and describe the characteristics of the learning program of ergonomics that promote sustainable well-being at work implemented in the SMEs. The specific research aims were to identify and to describe those characteristics in relation to:

- (1) a worker's individual capabilities and competence;
- (2) work organization and environment;
- (3) leadership.

### 4 Materials and methods

#### 4.1 Participants and enterprises

The data was gathered in 2005 and 2006 through individual thematic interviews of 14 students who participated in the study and carried out the learning tasks in 10 different SMEs. The participants comprised of 10 women and 4 men which two of them had no work contract (Table 1).

**Table 1** Background information of the participants ( $n=14$ )

Gender	Age	Education	Position in the SME	Branch of business	Headcount of the SME
Male	32	Vocational high school	Maintenance manager	Furniture industry	181
Male	47	Vocational school	Production manager	Nursery gardening	63
Male	40	University	Teacher (no contract)	Furniture industry	7
Female	45	Vocational school	Production manager (owner)	Clothing industry <sup>1</sup>	23
Female	61	Vocational courses	Managing director (owner)	Clothing industry <sup>1</sup>	23
Female	51	Vocational high school	Entrepreneur (owner)	Service home	10
Female	53	Vocational high school	Manager	Service home	20
Male	31	Vocational high school	Development engineering	Engineering works	156
Female	45	Vocational courses	Nursing staff	Service home <sup>2</sup>	29
Female	43	High school	Nursing staff	Service home <sup>2</sup>	29
Female	49	Vocational high school	Manager	Service home <sup>3</sup>	19
Female	40	High school	Nursing staff	Service home <sup>3</sup>	19
Female	40	Vocational school	Kitchen maid	Service home <sup>3</sup>	19
Female	48	University	Entrepreneur (no contract)	Corner shop	33

<sup>1–3</sup> same SME

The participants completed their basic studies of ergonomics 2 months—2.5 years before the interviews. The voluntary participants were informed about the purpose of the study and they had a possibility to withdraw their information at any time. The written approval was sought from the participants that they signed.

According to the headcount, seven of the enterprises can be classified as small-sized enterprises of 7–33 workers and three as medium-sized enterprises of 63–181 workers (European Commission 2005). Among the workers, there was an average of 13 sick leave days per year ranging in length from 4 to 28 days. During the past 2–3 years, sick leaves had decreased in 6 enterprises, increased in 2 enterprises and remained the same in 2 enterprises. The customers of the furniture, clothing, forest and engineering industries were usually dealers and wholesalers. The residents of the service homes were psychiatric, mental disabled, or seriously disabled people. The customers of the corner shop were local citizens.

## 4.2 Methods

The open themes of the interviews were derived from the aims of the study. The themes of the interview were given to the participants beforehand and were always carried out following the same pattern.

Interviews lasted for 30–70 min, and were performed in undisturbed conditions at the workplaces of the participants or in the researcher's office. The interviews were conducted, tape-recorded, and transcribed verbatim by the researcher (the first author). The data was summarized into a document of 151 pages. The anonymity of the participants and their enterprises were guaranteed by deleting the identification information before analyzing and documenting the data. Ethical principles concerning the handling of the data were also taken into consideration and the authentic data was available only for one researcher (e.g., Huberman and Miles 1994).

The data was analyzed according to the research tasks using a qualitative inductive content analysis (Huberman and Miles 1994; Krippendorff 2004), and the characteristics of the learning program which promote sustainable well-being at work were identified. Firstly, the authentic expressions were simplified, after that the sub- and main categories describing sustainable well-being at work were formed from the simplified expressions. Each main and subcategory were named and grouped according to its content. The data was presented qualitatively according to the research tasks (Tables 2, 3, 4 and 5). These characteristics mainly showed the outcomes achieved by the program but the promotion of worker's sustainable capabilities and competence were divided into characteristics showing both the outcomes and actions. In addition, the frequencies ( $f$ ) of the authentic expressions were calculated and presented in the tables to describe their prevalence. The atlas.ti 5.2 Software of the Windows program was utilized in the analysis (atlas.ti 2011).

## 5 Results

*The outcome characteristics of the learning program of ergonomics that promoted sustainable well-being at work in relation to a worker's individual capabilities and*

*competence* were divided into the following main categories: workers' health and well-being increased, workers' attitudes became more positive and their competence for developing work increased, so the quality of work outcomes was better, the participants' competence in ergonomics increased, and the ergonomics studies produced positive transfer on different levels (Table 2).

By investing time and resources to maintain mental and physical well-being, it was possible to increase the health and well-being of the workers. Also, the number of sick leaves decreased. Both the participants as well as the workers learned to develop work. The attitudes of the workers became more positive and their competence for developing work increased. Therefore, outcomes gained from the improvements were more valid. The competence of the participants increased and their position, in relation to ergonomics, inside the workplace strengthened. The participants also applied useful knowledge of ergonomics at their homes and in their hobbies (Table 2).

*The action characteristics of the learning program of ergonomics that promoted sustainable well-being at work in relation to a worker's individual capabilities and competence* were divided to the following main categories: actions to support worker's physical capacity increased by the workplace's own actions, or through the collaboration with the occupational health services, and actions to support workers' competence increased at the workplace (Table 3).

Various successful campaigns were arranged and permanent actions were developed to improve physical fitness of the workers through their own activity at the workplace or in the collaboration with the occupational health services. Training and education were arranged according to the workers' needs. The workers and managers agreed and decided on the topics of education. At some workplaces, workers needed and were given career development discussions besides or instead of education, for example, to clarify the distribution of work tasks (Table 3).

*The outcome characteristics of the learning program of ergonomics that promoted sustainable well-being at work in relation to work organization and environment* were divided to the following main categories: development of working methods increased at workplaces, development of working tools increased at workplaces, and development of working conditions and work community increased (Table 4).

Within the work community, the learning program provided a better collaboration and interaction among the workers. The workers and managers discussed and developed various measures to improve the work organization and environment. For example, physical and mental strain of the workers was decreased by keeping sufficient breaks during the work day, organizing efficient job rotations, and strain of the new workers were also decreased by mentoring and supervising. Work principals and prerequisites were also clarified and developed together at the workplaces. The participants familiarized each others on the discussion site of the learning program and they exploited skills for developing their own work (Table 4).

*The outcome characteristics of the learning program of ergonomics that promoted sustainable well-being at work in relation to leadership* were divided to the following main categories: manager's competence in managerial tasks and well-being increased, management support for developing the work and workers increased, and communication in the work community was developed with the support of management (Table 5).



**Table 2** The outcome characteristics promoting workers' sustainable capabilities and competence ( $n=14$ )

Main categories and subcategories	f <sup>a</sup>	Example of authentic expression (number of the interview)
Workers' health and well-being increased		
Workers' days of illness decreased	13	"It is clear that during the last 2 years the number of days of illness has fallen dramatically." (5)
Workers' mental and physical well-being increased	2	"...workers' mental and physical condition is good, and work is going well, so of course customers who come here see a worker whistling at his job, so they know the atmosphere here is good." (3)
Workers' attitudes became more positive and their competence for developing work increased, so the quality of work outcomes was better		
Workers' started thinking more about how to develop their work	14	"...workers have thought about how they do the work. They have thought about what is better for them but they have also thought about what is better for residents to be in the same situation." (4) - (for example, how to lift a resident)
Workers' opinions of developing work became more positive	5	"We have good work community and good atmosphere and compulsion to develop our work." (5)
Workers' competence improved and the qualitative of work and its outcomes increased	5	"...we have paid attention to our working methods, so of course it is more pleasant for our residents how we touch them, we are gentle with them and aren't in a hurry. Our working methods have become softer. And we have stopped rushing, we are in a good mood and don't snap etc. We treat our residents better." (6)
Participant achieved positive changes in workers to develop their work	4	"There were contact persons at the workplace during my ergonomics studies. The contact persons comprised the project group, and they planned 'the well-being at work day'. I supported the group but they planned the day by themselves." (9)—(before only the managers organized these kinds of days or meetings)
The participants' competence in ergonomics increased		
Participants started reflecting more about the use of ergonomics	22	"The ergonomics studies have opened my eyes to the fact that ergonomics is really an extensive concept... And every day at work I also think about ergonomics and question why things are the way they are." (9)
Participants' competence became visible through appropriate ways to approach the work	20	"And in a way, I could share the knowledge with others (for the younger workers). For example, don't lift residents that way, accidents might happen, use the lifting aids." (7)
Participants passed on knowledge of ergonomics to others and emphasized workers' own responsibility in ergonomics	11	"If I think about my own working postures and if I retract my abdominals, it helps in many cases...Now my competence has increased and I have said to the younger workers 'don't rush about, the consequences might be bad'." (4)
The ergonomics studies produced positive transfer on different levels		
Participant's positive attitude transferred to the work and to his/her whole life	8	"And it has become a way of life. Also at home I think about how I lift things and while I am doing something I think about how it might be done and how I have to organize some things in my work to avoid overstrain. It is challenge for me." (13)
Individual, workplace and society got benefits from ergonomics studies	4	"I think that the organization has got a good and active worker in me (participant)." (8)

<sup>a</sup> f (frequency) = number of authentic expressions from the interviews. The same point might be expressed in different ways, so every expression was counted separately

**Table 3** The action characteristics promoting workers' sustainable capabilities and competence ( $n=14$ )

Main categories and subcategories	f <sup>a</sup>	Example from authentic expression (number of the interview)
Actions to support workers' physical capacity increased by the workplaces' own actions, or through the collaboration with the occupational health services		
Actions to support worker's physical capacity were increased	18	"Then we thought about a fitness campaign for next year, that if we set up the same kind of 'reward' as last time. Last time, when workers exercise three times a week for 40 week, they got a shell suit and a heart rate meter. These 'rewards' motivated workers and they truly exercised." (10)
Collaboration with occupational health service was strengthened to increase worker's physical capacity	3	"Exercise breaks during the working day...were designed by a physiotherapist from the occupational health service. She came here and guided us and left written instructions. The instructions have passed on every working group." (12)
Actions to support workers' competence increased at the workplace		
Actions to support worker's education were increased	11	Interviewer: "What about the education for personnel, such as 'How to deal with a person who has mental problems'?" Interviewee: "Yes, it was organized. Nearly everybody was there and we also got material for those who were absent." (6)
Career development discussions were improved	3	"From the learning program of ergonomics, we got the idea that these discussions should be organized for groups of people doing the same kind of work." (9)

<sup>a</sup> f (frequency) = number of authentic expressions from the interviews. The same point might be expressed in different ways, so every expression was counted separately

Managers received valuable knowledge on various actions of development, and they realized that by working together, for example, by motivating, supporting and giving responsibility to the workers, successful developmental processes were achieved better than by working alone. For example, the support of the managers was essential when workers developed information methods at the workplace. Also, the skills of managers increased when they learned about factors that resulted in actual leadership abilities (Table 5).

## 6 Discussion

### 6.1 Discussion of the methodology

The use of the content analysis enabled better understanding of contextual characteristics of the learning program promoting sustainable well-being at work than using quantitative methods.

The generalization of the present results may be difficult and should be done carefully due to the small number of participants and different enterprises. Therefore, all relevant quotations were included in the analyses. The main problem of the qualitative content analysis is the adequate data-reduction during the analyzing process (e.g., Weber 1985). However, the material of this study can be considered large enough (151 pages). Furthermore, the use of low inference descriptors in field

**Table 4** The outcome characteristics promoting sustainable work organization and environment ( $n=14$ )

Main categories and subcategories	f <sup>a</sup>	Example from authentic expression (number of the interview)
Development of working methods increased at workplaces		
Practices to decrease workers' physical strain were promoted	16	"We have increased the number of breaks when bathing residents because the ventilation is very poor in the dressing room." (6)
Discussions about work increased and become more open, and the interaction between workers increased	16	"...I have discussed with people who where my tessees during my studies, and they said that the openness has increased and problematic things have been dealt with at once, no-one talks behind your back." (4)
Opportunities for acting together increased, and the interaction between workers increased	14	"Once a month we organize a development day of action and always 10–15 workers from different sections join in. And also their foreman is there to solve problems and to help organize the actions. The days have been very successful and the commitment has been good because the ideas come directly from workers. Nobody imposes those actions, they come from workers, and it is very effective because we really fix those problems." (1)
Through job orientation, the working tasks for new workers were clarified	11	"...but we work together, both new and older worker thinking about ergonomics. It takes time and we have got it." (5)
Through mentoring, the working tasks for new and also for older workers was clarified	8	"On-the-job learning and training are related to the well-being of workers. More workers have trained to do demanding tasks. Before, only three or four workers could do those tasks. Now the number of competent workers has doubled, and old workers have taught new ones, and in same time the older workers have learned themselves by doing other task." (10)
Workplace counselling were developed and clarified	8	"...about maintaining mental well-being, we have discussed that, and in workplace counseling we have brought it up. But in our experience, it is difficult to speak when you see that something is wrong with your work colleague. But we have grown and we have got resources to cope with problems in workplace counseling and help when a colleague is exhausted." (11)
Practices to decrease workers' mental strain were promoted	6	"Job rotation, so that in our service home we have shared heavy working tasks...for own mental well-being, and because the work is mentally demanding. If someone says she has been working with a demanding resident for a while, so could someone else do it today? It has functioned well." (7)
Practical safety exercises were increased	4	"We did 'Rescue plan' and we also carried out the practical exercises in collaboration with occupational health and fire services." (13)
Methods that decrease workers' physical strain were developed	3	"We have paid more and more attention to the techniques we move our residents." (12)
Development of working tools increased at workplaces		
Tools to decrease workers' physical strain were developed	16	"I measured the work load of a cook and her problems were: continuous standing, arms raised, repetitive work, rotation of the head and body, and stooping. One solution was that we provided lighter trays." (4)
Tools to increase workers' safety at work were developed	6	"Together with an other student participated to the learning program of ergonomics, we developed a system where the worker on the roof is always fastened with a safety harness. He couldn't fall down (some accidents have happened earlier)." (2)

**Table 4** (continued)

Main categories and subcategories	f <sup>a</sup>	Example from authentic expression (number of the interview)
Tools to decrease workers' mental strain were developed	5	"To do something about exhaustion, we developed 'The action model' collaboration with workers and the occupational health service. Now we try to solve those problems with the help of that model..." (1)
Development of working conditions and work community increased		
The principals for developing the work environment and work community were clarified	28	"...before the development work was more technical but now there is a little human element. So we don't think only about whether is the machine effective but also whether it is easy to use and safety". (1)
Safety at work was promoted together	27	"...We formed a group and implemented risks assessment. It has been implemented twice, and this year it is just going on." (12)
The prerequisites for developing work community were clarified	8	"Many things have been clarified for the personnel through the learning program of ergonomics. And the workers' understanding of ergonomics has increased, so the development work goes forward more easily than before." (14)

<sup>a</sup> f (frequency) = number of authentic expressions from the interviews. The same point might be expressed in different ways, so every expression was counted separately

notes and careful repeated auditing with the help of the research group increased the present qualitative power. Also, by using the inductive approach instead of the deductive one, all relevant expressions were included in the analyses (Huberman and Miles 1994).

The participants had a high knowledge of the learning program and this improved the relevance of the data (e.g., Endacott 2008). The participants could comment and make changes to their interviews. The data was transported into the qualitative software of atlas.ti program which proved to be suitable for this study. The coding rules were always applied equally. Direct quotations taken from the interviews and placed into the tables made them more interesting but translating quotations into English was laborious because the participants used dialect Finnish language.

Only the students took part in the research interviews. The results could differ if the workers involved in the developing work were also interviewed. Now, the students only gave their output on what happened at the workplace and on effects which the learning program had on the function of the work community. However, in the previous study by Pitkänen et al. (2008) which involved students of this learning program of ergonomics as well as workers who took part to the developing work reached similar results on the benefits and disadvantages of the studies.

## 6.2 Discussion of the results

The theoretical frameworks that this learning program of ergonomics is built upon are the concept of well-being at work (Ilmarinen 2006), the cycle of experimental learning (Kolb 1984), and on-the-job learning (Pohjonen 2002). Primarily, the focus of the program is not on sustainable development. However, the characteristics of

**Table 5** The outcome characteristics promoting sustainable leadership ( $n=14$ )

Main categories and subcategories	f <sup>a</sup>	Example from authentic expression (number of the interview)
Manager's competence in managerial tasks and well-being increased		
By working together, the manager's well-being increased	9	"Now I get workers opportunities to work together. I manage less and I am satisfied." (14)
Manager's responsibility and action in managerial tasks became more clear	7	"... today, in every office, the managers understand the biggest risks of the working environment and they must also know how to minimize those risks." (2)
Manager's training increased	3	"All managers in our workplace have gone through the special learning program for managers." (1)
Manager's readiness and resources for managerial tasks increased	2	"The learning program of ergonomics was such an extensive system, and I got resources for being an entrepreneur and for developing my managerial skills." (11)
Management support for developing the work and workers increased		
Manager's and management's actions became more supportive of developing the work and workers	21	"More meetings have been organized during working days and common issues have been discussed in those meetings". (9)
Employment contracts became longer or permanent	3	"...we have also multiplied our staff, and part-time contracts have become fulltime." (5)
Managers motivated workers to be more independent and to participate in training	3	"Workers' commitment to changes was more authentic because they got to do working tasks themselves." (10)
Communication in the work community was developed with the support of management		
Communication methods were developed	11	"And there's a list in our coffee room where everyone can write down things we need to discuss." (3)
Developing days and groups were created	2	"We have created a team because the flow of information was very weak in our organization. The team has developed a post-box system, and now the internal post moves better." (7)

<sup>a</sup> f (frequency) = number of authentic expressions from the interviews. The same point might be expressed in different ways, so every expression was counted separately

the program comprised of elements that dealt with of sustainable well-being at work through learning and these are the ones discussed here in the frame of OL.

All levels of the OL actualised well in the learning program. The students, who participated in the study, learned at the individual level of the OL, and the learning was mainly explicit (e.g., Bucic et al. 2010; Dyck et al. 2005; Nonaka and Takeuchi 1995). The results gained from this learning were the increased know-how of ergonomics and the ability to apply the knowledge they had of ergonomics. The participants distributed knowledge to their workplace and thus the information on sustainable well-being at work was accumulated once the workers and the managers got to share their own knowledge and experiences in joint (e.g., Helmfrid et al. 2008; Koplín et al. 2007). The team and organizational levels of OL begun in mutual discussions and increased as the developmental work was being executed (e.g., Bucic et al. 2010; Dyck et al. 2005; Nonaka and Takeuchi 1995).

The prerequisites for the actualization of the developmental work were the positive attitudes among the workers and an open atmosphere at the workplace (Table 2). Open atmosphere encouraged the workers and opened possibility to

participate in genuine cooperation, reflection, and discussion. These improved the quality of the results obtained from the developmental work as well as the sustainable well-being at work of the workers. Similar results have also been reported by Oerlemans and Assouline (2004) and Sammalisto and Brorson (2008). On the other hand, the cyclic model of the learning program as a means to support developmental work demands close cooperation at the workplace (e.g., Pitkänen et al. 2008; Ropponen 2009).

The competence of the students increased (Table 2) as they questioned their own actions, reflected on the work that needed to be done daily, and explored the best practices to enhance well-being at work. The students also inspired workers to take responsibility on the developmental work (e.g., Pitkänen et al. 2008) and aroused interest towards the improving of their physical fitness. Actions to improve physical fitness were mainly supported by the workplaces' own actions (Table 3).

The awareness of tacit knowledge was increased amongst the workplaces when the developmental principals for developing the work environment and work community were clarified during discussions (Table 4) (e.g., Becerra et al. 2008; De Long and Fahey 2000; Dyck et al. 2005; Reychav and Weisberg 2009). In these discussions tacit knowledge were utilized when the problems involving well-being at work were identified and everyone could produce different solutions that could be applied on the problem areas. Helmfrid et al. (2008), Koplin et al. (2007), and Oerlemans and Assouline (2004) also emphasized the importance of common discussions as a method to enhance sustainable development at workplaces. The tacit knowledge was also utilized when the new workers properly familiarized with their work tasks and they were signed mentors to guide their work (e.g., Saru 2007). In addition, according to this study, the development of the methods and tools that would decrease work strain and increase work safety was seen as an important factor contributing sustainable well-being at work.

The managers were actively involved in the discussions of developmental procedures and agreed on the methods that were to be used. They committed and encouraged and gave the workers more possibilities to participate in the developmental work. These results are similar to those obtained from previous studies that explored sustainable well-being at work focusing on leadership (Oerlemans and Assouline 2004; Perron et al. 2006; Remmen and Lorentzen 2000). In this study, the manager students felt that their own well-being and readiness and strengths in leadership skills increased due to their studies of ergonomics. This study also shows that in almost every interview the developing of communication methods were among the duties that needed improvements. The workers were interested in the developmental work of the enterprise and wanted to be informed about it. It was commonly agreed on that the managers were in charge of the communication systems.

All the students involved were active and the enterprises had a positive outlook in the developmental tasks of ergonomics. All enterprises, regardless of their size, achieved significant outcomes in the developmental tasks. Half of the students were either owners of their own enterprises or in the management position and this might have had an effect on the quick progress in the developmental work. On the other hand, some of the students held a lower level position and also they inspired other

workers and management to get involved in the developmental work as they themselves gained more competent.

Cooperation on the grounds of sustainable well-being at work (e.g., Fresner and Engelhardt 2004; Helmfrid et al. 2008; Koplin et al. 2007), especially among external parties was scarce. There was some cooperation with the occupational health services. In the future, when the learning is further developed, cooperation with external clients could be improved. Strong networking among clients could enhance the competitiveness of the enterprises as it would able discussions concerning new and innovative product ideas.

## 7 Conclusions and recommendations

Several action and outcome characteristics of the web-based learning program that promote sustainable well-being at work were identified and described in the categories of the worker's individual capabilities and competence, in the work organization and environment, and in the leadership. The learning program can be considered a feasible and efficient in the light of promoting sustainable well-being at work.

Competent workers are the most important resources of the enterprises. Their sustainable well-being at work should be worth investing in. In every enterprise, including the small ones, there should be trained personnel that are responsible of the well-being at work.

The target of the future study will be to identify and describe the connection between the studies of ergonomics and sustainable well-being at work in a large scale enterprise. Finally, there is a need for more empirical research to confirm and describe the connection between sustainable well-being at work and learning.

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