

## Ergonomic aspects of the study process in higher education

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The basic tenets of Latvia's sustainable development strategy for 2030 are: the happy citizens of a prosperous country, a sustainable and healthy lifestyle, creativity, resourcefulness, tolerance and an innovative competitive economy. In the context of higher education this is to be understood as students developing competence during the study process, learning to comply with correct ergonomic principles to ensure life-long comfort for all and to not cause health problems. The aim of the study is to investigate the ergonomic aspects of the study process in higher education and to improve student competence as a result. The methodological basis of the research is the study of publications pertaining to the theme of this inquiry, semi-structured student interviews and empirical research methods- surveys of university students. Based on the findings of the student survey, the authors concluded that it is necessary to improve the study process by developing the students' competence in ergonomic terms.

*Competence development, ergonomic, higher education, study process*

### Introduction

The term ergonomic is used among EU Member States, but in the USA the term used is human factors.

The International Ergonomics Association (2017) has given its definition:

*Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.*

Within the discipline of ergonomics there exist domains of specialization which represent deeper competencies in specific human attributes or characteristics of human interaction:

1) Physical ergonomics - working postures, materials handling, repetitive movements, work related musculoskeletal disorders, workplace layout, safety and health.

2) Cognitive ergonomics - mental workload, decision-making, skilled performance, human-computer interaction, human reliability, work stress and training as these may relate to human-system design.

3) Organizational ergonomics - communication, crew resource management, work design, design of working times, teamwork, participatory design, community ergonomics, cooperative work, new work paradigms, virtual organizations and quality management.

As a result of the intensity of life in the 21<sup>st</sup> century, there have been significant changes in work safety - in both education and work environments it has become increasingly more necessary to use information and communication technologies (ICT), especially in computer-related work.

It is important to use ICT in accordance with ergonomic requirements (Brizga, Peks, Bertaitis, 2013), because each community member's life and health must be preserved throughout their lives for the sake of developing a sustainable society.

One of the conditions of sustainable community development is the human potential for work. (Ilmarinen, 2006)

This is determined by the specific work process – work environment, work conditions, work demands, work management, team relationships, as well as the competence

of the individual with all of its components – attitude, knowledge and skills.

It is important for humans to be aware of health as a value, and to understand their capacity and ability to perform a specified job without harm to health (Ilmarinen, 2007).

In the educational context, competence is the ability to acquire and responsibly apply knowledge, skills and attitudes (Briede, 2009), and competence development is a socio-constructivist learning process (Mulder, 2014) which is crucial to social interaction and specified job quality improvement processes.

The study process goal is to improve the competence of students who are prospective experts of various sectors of the economy, including ergonomic risk assessment.

### Methods

The methodological basis of the research is the study of publications pertaining to the theme of this inquiry, semi-structured student interviews and empirical research methods (surveys of university students.)

To research the study process improvement opportunities in the context of ergonomics, an anonymous students' survey was carried out.

Participants were 8 students enrolled in the first year course, 13 students in the second year course, 29 students in the third year course, and 20 students in the fourth year course. In the data analysis nonparametric statistics, modes, medians and amplitudes were used.

### Results and Discussion

The study period was from September 2016 to February 23, 2017. The obtained data are summarized in Tables 1, 2 and 3.

**Table 1.** Profile of respondents

Respondents	1 course	2 course	3 course	4 course	Total
Number of respondents	8	13	29	15	65
Respondents' age, in years					
<20	8	4	-	-	12
21 - 30	-	9	29	15	53
Respondents' sex					
Female	6	3	2	1	12
Male	2	10	27	14	53

The cooperation of the 65 respondents made it possible to examine the extent of the students' knowledge before and after the course, and the results influenced recommendations for improvements in the ergonomic aspects of the study course.

The data suggest (Table 2) that the majority of students (46) did not have sufficient knowledge of ergonomics before the start of the course. Only a few respondents (12) indicated that they had acquired knowledge at previous educational institutions, or at work (7). It became apparent that 18 respondents were very familiar with load ergonomics. Even after the study course, directly load ergonomics students knew better.

**Table 2.** Respondents' observations on ergonomic aspect

Respondent		1 course		2 course		3 course		4 course	
		Before	After	Before	After	Before	After	Before	After
Do you have knowledge of ergonomics?	Yes	-	6	4	18	13	20	6	13
	No	1	-	13	-	16	1	8	2
	Partial	-	2	-	1	-	8	-	-
Total		1	8	17	19	29	29	14	15
Where did you get knowledge?	Family	-	-	-	-	3	-	-	-
	Educational institution	-	-	4	16	8	-	-	13
	Therapist	-	-	1	-	3	-	-	-
	At work	-	-	1	-	1	-	6	8
Which ergonomics section is familiar to you?	Physical load ergonomics	-	-	4	-	12	29	6	13
	Cognitive	-	-	-	-	-	-	-	-
	Organizational	-	-	-	-	1	-	4	8

Respondents' competence self-assessment data showed (Table 3) that competence did not change for 4 students, but increased for 25 students.

**Table 3.** Changes of competence in work and civil protection studies

Respondent's code	Self-assessment			
	Initial	After the course	=	>
1	4	4	1	
2	4	4	1	
3	2	4		2
4	2	4		2
5	2	4		2
6	1	4		3
7	1	5		4
8	2	4		2
9	3	4		1
10	2	4		2
11	2	4		2
12	2	4		2
13	2	4		2
14	3	3	1	
15	2	4		2
16	2	4		2
17	2	4		2
18	1	4		3
19	1	3		2
20	3	3	1	
21	2	4		2
22	3	4		1
23	2	4		2
24	2	3		1
25	3	5		2
26	2	4		2
27	1	3		2
28	1	3		2
29	1	3		2
Total	2	4	4	51
Mode	2	4	1	2
Median	2	4	1	2
Mean	2,07	3,8	1	2,04

Respondents' recommendations showed that it is necessary to improve the cognitive competence study course in both theoretical and practical courses, because more often stress is caused by psycho-emotional risk factors, as well as fatigue both at the university and outside it.

In the data analysis nonparametric statistics – modes, medians and mean were used (Mean, Median and Mode Calculator). A five-level scale was used in the study to measure the students' self-evaluation of competence development on the ergonomic aspect. Self-evaluation was carried out by 29 students in their third year in the Faculty of Information Technology.

## Conclusions

Results of assessment of students concludes that

1. Students' competence is developed;
2. It is necessary to improve the Work and Civil Protection study course in the aspect of cognitive ergonomics;
3. Further research is recommended to improve future specialist competence development in ergonomic aspects.

## List of Literature

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Резюме

Авторы статьи исследовали эргономические аспекты учебного процесса высшего образования. Целью исследования являлось повысить компетентность студентов – будущих специалистов. Авторы провели интервью и опросы, исследовали научно теоретическую основу развития и совершенствования компетентности для выявления возможностей усовершенствования учебного процесса высшего образования со стороны эргономического подхода. Полученные данные свидетельствуют, что большинство студентов до начала учебы не имеют достаточных знаний в эргономике. Некоторые студенты указали, что определенные знания получили в предыдущих учебных заведениях или на работе. Выяснилось, что знаниями эргономики по нагрузкам студенты владели лучше. Оценивая студентов – будущих специалистов по уровню знаний выявлено развитие компетентности, однако для совершенствования учебного процесса с точки зрения эргономики необходимо применять подход в области когнитивной эргономики. Рекомендуется дальнейшие исследования в разрезе развития компетентности.

*Развитие компетентности, эргономика, высшее образование*

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